BOXLEY GRIST MILL

Buffalo National River
Ponca, Arkansas

HISTORIC STRUCTURES REPORT

Physical History and Analysis Section

FINAL DRAFT COPY

November, 1991
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Edited by;
Thomas Vitanza, AIA
Historical Architect

WILLIAMSPORT PRESERVATION TRAINING CENTER

Harpers Ferry Center
National Park Service
U. S. Department of the Interior

Williamsport, Maryland
This Final Draft Copy of the Physical History and Analysis Section of the Boxley Grist Mill Historic Structures Report was prepared by the Williamsport Preservation Training Center, for the Division of Conservation, Southwest Cultural Resources Center, Southwest Region of the National Park Service. The Williamsport Preservation Training Center (WPTC) is administered by the Harpers Ferry Center. Its mission is to support the preservation and maintenance mission of the National Park Service by providing a comprehensive program of preservation education and employee development. The center is staffed by Historical Architects, Exhibits Specialist/Restoration, and other preservation professionals who provide technical support to the Center. WPTC services park units throughout the National Park System.

This Physical History and Analysis Section was commissioned in 1988 with a request from the Regional Director, Southwest Region, John Cook for the Southwest Cultural Resources Center, Division of Conservation. Field work was conducted by WPTC in April 1988. Former Division of Conservation employees Douglas Hicks and William Hose, both Exhibits Specialist/Restoration, were accompanied by Historical Architect Thomas Vitanza. All three had been involved with the Mill since the initial emergency stabilization work in 1984 and were well acquainted with the structures past record. A rough draft of the report was completed on-site and at Steel Creek.

Much of the initial text which dealt with the fabric investigation and the analysis of the individual building components was written by Bill Hose. The chronology of construction was a collaborative effort between Hicks, Hose, and Vitanza. Hicks put together the Phase I and Phase II Project Records.

A Review Draft Copy was completed and circulated in June 1988. Review comments were returned to Williamsport later that year. It was discovered that additional field work would need to be completed before the report could be fully revised.

Some field work was carried out by Carey Feieraband, Historical Architect and Jake Barrow, Exhibits Specialist/Restoration of the Division of Conservation, Southwest Region in the summer of 1989. Notes from their efforts have been incorporated into this Final Draft Copy.

WPTC Historical Architect Thomas Vitanza returned to the Boxley Grist Mill in October 1991 to complete field work and acquire additional photographs. Additional historical data was provided by Buffalo National River Park Historian Suzanne Rogers.
In the intervening years the Southwest Region completed the reroofing of the Mill in accordance with recommendations which were made in the Draft Review Copy. Those recommendations are also included in this document.

The final rewriting and editing of the text, and integration of the illustrations resulted in the document presented here. This work was completed by Thomas Vitanza in October and November 1991 at Williamsport.

Also a part of this Final Draft Copy of the Physical History and Analysis Section of the Boxley Grist Mill Historic Structures Report are the Final Project Records and Completion Reports for the Phase I and the Phase II Stabilization Projects carried out by WPTC in 1986 and 1987 respectively.

In order for the Historic Structures Report to be completed to National Park Service standards the following sections still need to be completed: Administrative Data, and Historical Data. Also, a Project Record and Completion Report of the 1989 project to reshingle the mills roof with white oak shingles should be completed by the Southwest Region, Division of Conservation for eventual inclusion in the HSR.

Thomas A. Vitanza, AIA
Williamsport, Maryland

November 19, 1991
The mill has been in our family longer than I can remember. I bought it from my father who ran it many years. I'd like to reroof it and preserve every piece of it but that would cost me more than I can afford, and it wouldn't pay me to do that. It's hard for me to decide just what to do with it.

Illustration A. Clyde Villines, Last Operator of the Mill at Boxley.

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30. Boxley Grist Mill; Southwest and Southeast Elevations and Roof Showing Early Wood Shingle Roofing Partially Covered with Metal Sheeting, Also Millrace Is Collapsed. NPS, BUFF photograph, circa 1959.


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Illustration 1. Area Map, Boxley Grist Mill.
Illustration 2. Vicinity Map, Boxley Grist Mill, showing vicinity of mill to Millpond, Mill Creek, and Buffalo River.
I. INTRODUCTION

Overview

Acquired by the National Park Service in 1985, the structure commonly known as the Boxley Grist Mill has long been recognized as one of the primary historical attractions of the Upper Buffalo River Valley. Located in the west central portion of Newton County, Arkansas, near the villages of Ponca and Boxley, this structure contributes significantly to the interpretation of the traditional cultural landscape of the area known locally as the Boxley Valley (Ill. 1 and 2).

The currently existing structure is commonly thought to have been constructed in the 1870's. All through its early existence and into the 1940's it has played an integral role in the development of community identity at Boxley. The mill continues to this day to be a well known regional landmark (Ill. 3).

The structure has been formally recognized for its contribution to early 19th century industrial technology on a locally significant level by being included in the National Register of Historic Places. It was listed on July 31, 1974 and has since been the subject of much interest on the part of the National Park Service. Not much is known of this structure in terms of specific dates and routines of operation; the details are shrouded by local folklore.

The context of this report is as identified by the Cultural Resources Management Guideline, NPS-28. Categorized as a Physical History and Analysis Report (PHAR) it is a section of an Historic Structure Report (HSR). It is the purpose of this type of report to document, detail and define the evolution of a given structure since its initial construction.

Investigation for this structure is limited to analysis of those certain evolutionary changes which have taken place. These changes are evident in the timber frame of the structure and can be verified by extant remains.

To date, no historical, archeological or documentary research has been conducted for the preparation of this report. However, information generally available and in the already existing project

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Illustration 3. Boxley Grist Mill; Southwest Elevation, prior to beginning of stabilization efforts.
documentation has been incorporated. All known and verifiable information has been chronologically assembled and organized.

It is the intention of this report to outline some of these physical changes as they are currently understood. In order to make this information more useful to future researchers, this report will present a framework to assist in the organization of current and forthcoming documentary and historical research.

Administrative Background

Documentation by the National Park Service begins with a mention in the 1967 Draft Master Plan for Buffalo National River, which identifies the mill as "a significant relic". Another early mention of the mill and its potential interpretive value was described by the 1968 Proposed Buffalo National River Report.

The story of settlement and homesteading along the Buffalo (River) would be told with a pioneer farm ... that era could also be brought to mind in a working exhibit of Boxley's Water Mill.4


This written report is the earliest mention of the mill after the establishment of the park, Buffalo National River, in 1972. An overview of the structure is provided:

This two story frame building was constructed in 1870 by Robert Villines, grandfather of Clyde Villines, the mill's present owner and its last operator. For eighty years, the mill served the local area as an economic and social center. Finally, in 1950, Clyde Villines closed the mill. A tin roof has kept the mill from deteriorating badly, and the building appears to be structurally sound.

The Park Service should attempt to purchase the mill, restore it, and return it to good working order. The mill could

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become a major attraction in the Boxley area, and would be an important part of the interpretive program.

Mr. Ed Baxter, of the Arkansas Historic Preservation Office, in Little Rock, is preparing to nominate this structure to the National Register.

The Boxley Grist Mill was entered into the National Register of Historic Places by the Arkansas Historic Preservation Program for the Arkansas History Commission on July 31, 1974. This document identifies the mill as the primary historic cultural resource of regional industrial significance within the boundaries of the Buffalo National River. The Nomination Form lists the mill with two names; the Common Name given is Old Boxley Water Mill, while the Historic Name is given as the Whiteley Mill. Notification of this listing appeared in the Federal Register.

For a decade the structure endured as limited interest and funding generated no apparent research or correspondence. From the mid 1970's to the mid 1980's little action was taken as Buffalo National River was in the midst of park development programs.

However, with the coming of the 1985 Land Use Plan, Cultural Landscape Report for the Boxley Valley 6, interest was regenerated by the developing awareness for vernacular cultural resources.

The foundation for the Cultural Landscape Report was laid in late 1983 when inventory and condition assessment of cultural resources was being carried out in the Boxley Valley. Field inventory forms, photographs, and inspection reports were independently prepared by Field Historian, Laura Soulliere of the Southwest Region, Division of History and by C. Craig Frazier, Historical Architect, Central Team of the Denver Service Center. Both reports documented the neglected condition of the structure. The Classified Structure Field Inventory Report brought to the forefront the immediate need for emergency stabilization work if the structure was to survive.

The building is in very poor condition. Sags are noticeable on all floors. The sill timber in the east corner shows evidence of rot and severe deterioration. The last


floodwaters [1961] came to within one foot of the floorboards on the east corner, severely undermining the stone pier foundations. In that corner, the stone piers no longer function. Rather, the heavy timber frame is holding itself up -- the mortise and tenon joints are pinned with wooden pegs, which keep the timbers connected.

Some minor structural assistance is given by the supporting frame of one of the grinding wheels (this is the hurst frame) at the foundation level. The whole building is listing toward the east.

Buffalo National River was developing a keen administrative interest in assessing its cultural resources in the mid 1980's under the guidance of Superintendent Alec Gould and Assistant Superintendent James Liles. It is through their leadership that preservation of significant cultural resources became one of the primary management goals at Buffalo.

Through park and Regional initiative, the Southwest Cultural Resources Center (SWCRC) Division of Conservation Preservation Crew became involved in preservation work within the park during the summer of 1984. Initial involvement was confined to the Parker-Hickman Cabin in the Erbie district of the park. Association with the Assistant Superintendent made the SWCRC preservation crew aware of the existence and deteriorated condition of the Boxley Mill.

At this time the structure and grounds were still in private ownership, but it was known the park would soon be purchasing the property. Members of the Southwest Region Division of Conservation's professional staff were encouraged to provide some recommendations to prevent further deterioration and the possible collapse of the building. The ensuing emergency stabilization work would be done to prevent the loss of the structure before it came into Federal ownership. Additionally, this work would provide some additional time while the Buffalo National River Lands Office was negotiating with the owner. The SWCRC policy at this time as that all work completed would be temporary in nature and easily reversed.

Arrangements were made with the owners to allow this emergency work to be accomplished. This work is now referred to as the Pre-Ownership Emergency Stabilization Phase.

The National Park Service acquired the grounds, Tract 62-108, the mill and its contents on July 18, 1985.

This effort to focus attention and financial resources on the cultural features of the park can be seen in the recently updated Cultural Resources Management Plan. In this document the Superintendent states:

The Act of March 1, 1972 speaks of conserving and interpreting an area containing unique scenic and scientific features and preserving the river. Certainly the river is the number one resource, but the features of the whole area are an integral part of the reason for establishing Buffalo National River. The legislative mandate for Buffalo does include history along with free-flowing water, fish, wildlife, geology, archeology, scenery, caves, paleontology, botany, and more.

These features are generally described in the Act of March 1, 1972 itself as "scenic and scientific features".  

Statement of Intent

Situations will arise where elements which no longer wholly exist will need to be addressed. Treatments such as the reroofing of the mill, the staining of the exterior, the partial reconstruction (or major stabilization) of the wood frame addition or the so-called "miller's office", and the reconstruction of the hypothetical waterwheel are beyond the strict definitions of NPS-28.

Whether these actions be considered restoration or reconstruction is a matter of definitions. The General Treatment and Use Standards insist that repair and/or replacement of architectural features be accurate and verifiable. The implementation of recommendations concerning these specific issues will need to be based on sound architectural and historical research leaving the reviewer with a minimum of doubt concerning additional work. In most instances additional information will be required before this level of intervention can be supported by NPS-28.

To date all work carried out at the mill has been based on verified documentation and extant fabric remains and has been executed in such a manner that it detracts minimally from the appearance and significance of the structure. Where a specific element could not be retained due to excessive deterioration, etc., it has been replaced by an element of similar specification and has been identified as a later addition to the structure. This was accomplished by dating all new members with the month and year of installation as well as recording the location of these new members.

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in the Completion Reports of the respective phases. All future work should be consistent with this policy.

The several physical improvements to the fabric of the mill, as recommended and outlined by this report, represent significant visual changes to the appearance of the structure. These improvements are based on substantive physical and historical evidence. However, some of the character defining elements of the mill, as they exist at time of writing, may be modified or altered as a result of this work.

The differences in the visual character will have to be reconciled with the issue of preserving the extant physical remains of this structure for the education and enjoyment of present and future generations. The Boxley Mill has been changed over time in order to meet the needs of its users.

The changes recommended by this report are within the scope of the current stabilization/preservation framework. Any desire to maintain the current (1988) appearance for aesthetic or nostalgic reasons should not preempt further efforts to continue the physical preservation of the mill and its contents.

Statement of Purpose

The Physical History and Analysis Section of the Historic Structure Report for the Boxley Mill is to be considered a portion of a more comprehensive report to be developed as time and resources allow. Its immediate purpose is to meet the basic need for a physical history of the building based on a limited fabric investigation. It fully documents the stabilization and preservation work which has been completed in recent years (1984 through 1988). Completion Reports for the two major phases of preservation work are included with this section as separate documents as are the Preservation Work Plan and Scope of Work for these phases. Additionally, it documents known physical evidence of the structural evolution which has taken place from the construction of the building through to its current condition.

This one section of the Historic Structure Report will not alone meet all of the requirements of the NPS-28) developed by the National Park Service for the content of HSRs, but will pull together and document the known and verifiable information.

The analysis of the physical history of the Boxley Mill is the beginning of a process which will document, evaluate and integrate all that is known concerning the evolution of this particular structure in the context of its social and cultural environs. It is only through the synthesis of all this information that a balanced picture of the role of the Boxley Mill in this Ozark community will become clear. Therefore, the material presented
here may have to be tempered and re-evaluated based on the results of future architectural, historical, archeological, engineering and landscape architecture research and analysis.

Preservation Program

In September of 1984, the National Park Service began what has become a multi-year involvement in the preservation of the Boxley Mill. The physical stabilization and preservation program which has been implemented can be grouped into five basic phases; these are outlined below.

1. **Pre Ownership Emergency Stabilization**
   September, 1984

2. **Phase I, Scope of Work**
   Beginning of Structural Stabilization
   May through July, 1986

3. **Phase II, Planning**
   Research, Documentation and Assessment
   Historic Structures Consultation & Report
   Historic Millwright Consultation & Report
   Historic American Engineering Record Project
   Continuation of Structural Stabilization
   May through August, 1986

4. **Phase II, Preservation Work Plan**
   Continuation of Structural Stabilization
   Preservation of Exterior Elements
   March through August, 1987

5. **Phase III, Physical History and Analysis Report**
   Planning for the Completion of the Exterior Preservation
   of Historic Fabric and Documentation of the Mill
   Task Directive: SWRO/HFC-WPTC
   Begin Historic Structure Report
   Review Draft of Physical History & Analysis Report
   April through August, 1988

The Physical History and Analysis Report will serve to document the work which has been accomplished from the emergency stabilization work of 1984 through the completion of the Phase II Preservation Work Plan project of 1987. It will also meet the criteria set forth in the Task Directive between the Southwest Region Office and the Williamsport Preservation Training Center, Harpers Ferry Center, dated March 31, 1988.

Completion Reports for Phase I (1986) and Phase II (1987) construction will also be incorporated with this report as separate documents. Also, the Historic American Engineering Record (HAER)
drawings Boxley Grist Mill, AR-3 are attached as an integral part of the project documentation.

Together with the Completion Reports and the HAER drawings, the Physical History and Analysis Section will be the first component of the Historic Structure Report for the Boxley Grist Mill to be completed.

Many local stories exist concerning historical events which have taken place at the mill. All contain varying amounts of information laced with folklore, and few can be confirmed. Consequently, there is much speculation concerning the exact development and use of the structure over the course of its existence. It is through this effort to catalog, verify and coordinate this information that some sense may yet be made from these Ozark tales, and their true value be known.

Preservation Philosophy

The concept which has been taken with the preservation plan dealing with the Boxley Mill has been guided by professional concerns. These concerns can best be expressed as stated in the NPS-28, Chapter 3, "Standards for Managing Historic and Prehistoric Structures (Including Ruins)". The "General Treatment and Use Standards" lay out the primary philosophy on which these concerns are based. This document states:

The distinguishing qualities or character of a structure and its environment shall not be destroyed. The removal or alteration of any significant material or distinctive architectural features should be avoided when possible.

Changes which have taken place over the course of time are evidence of the history and development of a structure and its environment. These changes may have acquired significance in their own right, and this significance should be recognized and respected.

Deteriorated architectural (and structural) features shall be repaired rather than replaced, wherever possible. In the event replacement is necessary, the new material should match the material being replaced in composition, design, color, texture, and other visual (and structural) qualities.

Repair or replacement of missing architectural (or structural) features shall be based on accurate duplications of features substantiated by archeological, historical, physical, or pictorial evidence rather than on conjectural designs or the
availability of different architectural (or structural) elements from other structures.  

The early descriptions of the mill, such as the 1974 National Register Nomination Form, point out that the building was essentially intact.

The mill has deteriorated due to disuse and a faulty roof. Much of the clapboard siding is in a state of rapid decomposition and some of the boards are missing. Floor planks are weak and unsafe. However, the oak beams and cedar rafters ARE IN AN EXCELLENT STATE OF PRESERVATION (emphasis added) and the structure remains fairly level.  

The structural integrity of the mill was still apparent in the early 1980's, both in the components of the framing system and in the quality of integral milling equipment which remained in place.

Not only are the building, pond, and race present but more important, the various equipment necessary for the operation of a flour and grist mill remains largely intact.  

It has been noted that due to the significant amount of milling equipment left in place the mill gives the appearance that the last miller, Clyde Villines, simply closed the door behind him one day in the late 1950's and never returned (Ill. 4). In reality, "A general lack of business forced Clyde Villines to cease the mill's operation in the 1960's ending a long history of community service".

The relatively good condition of most of the structural members coupled with the integrity of the various architectural and functional components of the mill was significant. It was

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9 Cultural Resources Management Guidelines, pgs. 4-9. This guideline supplements and complements other NPS and Departmental directions on the subject of cultural resources management.


11 Edward P. Baxter. National Register Nomination Form, Section 8 - Significance

12 Edward P. Baxter. National Register Nomination Form, Section 8.
One of possibly two French Burr Stones used at the mill.
determined by the Southwest Region and the park management that
the preservation of these elements would guide all phases of this
project.

Therefore, the design and execution of the work at the mill, from
the beginning of the summer emergency stabilization project of 1984
through the latest Phase II work, has had to meet the standards
which ensure the historical and archeological integrity of the
building and site. Archeological and legislative compliance
requirements were handled by the park management as detailed in the
Phase I Scope of Work\textsuperscript{13} and the Phase II Preservation Work Plan.\textsuperscript{14}

Though located in a somewhat remote area, the mill operators were
apparently interested in keeping the technology of their operation
somewhat up-to-date. This desire inevitably led to alterations in
the equipment and the milling process.

It is the physical manifestation of these changes which hold some
of the clues to the development of the mill.

Consequently, any evidence such as tool markings, nails, framing
changes, altered structure, etc., contained in the transitional
wood frame needs to be continually preserved.

Much of the extant historic fabric besides the frame contains the
physical evidence necessary to determine, or verify, the sequence
of construction and evolution of the building. As future
historical and archeological research is conducted it will become
important to re-evaluate the conclusions drawn from the physical
evidence. Leaving this evidence intact has been a crucial factor
in the design of the various phases of treatment thus far. It has
been the goal of the designers and craftspeople not to preclude any
opportunities for future research to analyze the components of the
structure.

All efforts have been made to also retain and preserve the
integrity and character defining elements which are a part of the

\textsuperscript{13} Thomas Vitanza. Phase I Preservation Work Plan, (Scope of
Work), Boxley Mill, Package No. B-47, Buffalo National River,
"Compliance, Archeology, and Documentation Sections", Division of
Conservation, Southwest Cultural Resources Center, National Park
Service, US Department of the Interior, Santa Fe, New Mexico, April
24, 1986.

\textsuperscript{14} Thomas Vitanza and Douglas Hicks. Phase 2 Preservation
Work Plan, Boxley Grist Mill, Buffalo National River. Division of
Conservation, Southwest Cultural Resources Center, National Park
See FY87 Assessment of Actions Having An Effect on Cultural
Resources Form, XXX Form.

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Boxley Mill. The stabilization and preservation of the historic fabric has conceptually guided the design and execution of Phases I and II, including structural work, with minimal loss of historic or structural integrity. The work completed to date has been done recognizing the fact that all fabric intervention was being done without the benefit of an approved Historic Structure Report.

The preservation approach of the project has thus far followed the parameters set forth for planning, programming and implementation of stabilization and preservation as established by NPS-28.

Stabilization shall re-establish the structural stability of a structure through the reinforcement of loadbearing members or by arresting deterioration leading to structural failure. Stabilization shall also re-establish weather resistant conditions for a structure.

Stabilization shall be accomplished in such a manner that it detracts as little as possible from the structure's appearance and significance.

Preservation shall maintain the existing form, integrity, and materials of a structure.¹⁵

Until an approved method of ultimate treatment is approved, and a preservation program is established, further fabric intervention of the extant structure should continue to be in the stabilization and/or preservation mode.

II. ARCHITECTURAL DATA

Building Significance

From the National Register Nomination Form: "The Boxley Mill is an excellent example of a once common local industry which was vital to the settlement and economic development of many early rural Arkansas communities. Not only are the building, pond, and race present but more important the various equipment necessary for the operation of a flour and grist mill remain largely intact".¹⁶

The mill has long been recognized as one of the primary historical attractions of the Upper Buffalo River Valley. It contributes significantly to the interpretation of the traditional cultural landscape of the Boxley Valley. Cited in the Cultural Landscape Report, Boxley Valley the mill was classified as a Level 1 structure. This report established priorities for the preservation of historic properties based upon their individual significance and the extent to which they contribute to the Boxley Valley Historic District. The purpose of these was to help owners and occupants maintain their properties in a manner "which perpetuates the special qualities that make the valley a unique place". Level 1 structures, "... are historic structures of individual outstanding architectural and/or historical value and which make an important contribution to the integrity of the Boxley Valley Historic District".

The Boxley Grist Mill is an individually listed structure on the National Register and promotes the "highest priority for use and preservation".

Description of the Structure

The Boxley Grist Mill is a rectangular two story transitional wood frame structure with a gable wood shingle roof. The building was described in the Boxley Valley Cultural Landscape Report as representative of the town-scale commercial structures of the New South Ozarks phase (Ill. 5, 6, 7, and 8). Architecturally, the building "does manifest a dim shadow of transitional Greek Revival styling". This is evident in the box cornice with its returns, the box eaves at the gable ends, the trim horizontal clapboard siding, and the simple detailing of the corner boards, window and door trim.

The structure is sited with its primary axis along a NW-SW line. The building footprint measures approximately 30 feet/6 inches across the NW and SE elevations and 35 feet/6 inches across the SW and NE facades. It is a two story structure with a full height attic which creates a third floor. It is raised slightly above the ground by its stone pier foundation system and measures approximately 34 feet from the ground to the ridge of the roof. Originally dry laid, recent preservation work has resulted in many of the piers being dismantled and relaid with mortar.

The corner braced timber frame consists of hewn primary structural members, i.e., plates, posts, joists, and beams, which are connected using a pegged mortise and tenon system. The primary frame is bisected by an interior post and beam system which creates a four bay structural grid.

The roof framing structure consists of cedar rafter poles supported only at the rafter plate and the ridge.

The primary frame is infilled with lighter weight non-loadbearing studs (struts) and support members. The studs are hewn flat on two sides creating a flat surface to which the exterior clapboard siding is nailed.

The exterior is currently untreated, but physical evidence points to a painted surface. Paint analysis indicates a barn red pigment.

The interior is utilitarian in nature and is unfinished with the exception of the plank flooring. Notable on the interior is the milling equipment, much of it in its original location.

The windows are 4 over 4 double hung wood sash frames with through tenoned construction pegged at the corners. Some of the sash have been replaced with exterior board shutters. Most doors are of the clinch nailed batten construction type fabricated using tongue and groove boards. Hardware is very simple where it does exist, in most cases non-commercial hardware suffices.

Summary Description

The Boxley Grist Mill is a rectangular two story transitional wood braced frame structure with clapboard siding and a gabled wood shingle roof. Simple Greek Revival detailing is evident in the box cornice and return, the box eaves, and the exterior trim (Ill. 5, 6, 7, and 8).


Period of Significant Operation

The Boxley Grist Mill is a structure which has survived because it has been changed over time with the developing needs of the constituent Boxley community. Several phases of development have been identified and discussed in both the Physical History and Assessment Report and in the Historic American Engineering Record survey drawings, AR-3, 1986.

What is important to recognize is that the existing mill cannot be "restored" according to The Secretary of the Interior's Standards for Rehabilitation back to an earlier period without significant loss of existing historic fabric. But it can, and should, be preserved and maintained in its current condition.

The earliest phase of operation at the mill is most likely the water wheel phase. However, the physical remains from that time period in terms of historic fabric and the actual appearance of the structure are very limited.

Significant structural alterations were made to convert the mill operation to the turbine transmission system. These changes impacted the operation of the mill equipment, and the use and the appearance of the mill building. The extant fabric dates primarily from this period of operation.

It is perhaps more important to define a significant period of operation for the mill which is based on the existing fabric and equipment, rather than attempt to define a period of significance in terms of a specific time frame or period of years. The associative values related to the early and developmental phases of the mill can only be determined through a formal historical data research project.

Therefore the period of operation which is most significant to the existing mill structure begins with the conversion of the power transmission system from segmental waterwheel to the cylinder gate turbine powered transmission system. This period continued through the twentieth century to the eventual closing of the mill due to lack of commercial interest, personal interest on the part of the miller, and the gradual deterioration and ultimate collapse of the mill race.

The approximate dates for this significant period of operation would be 1901 to circa 1950/51.

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The 1901 conversion date is offered by Charles Howell in his 1986 report on the milling operation at the Boxley Mill. It is based on the patent dates for the turbine system which was installed at Boxley (allowing also ten years lag time) and circumstantial evidence of a date (1901) etched into a pier built to support the turbine drive shaft.

The closure date of 1950/51 is based on scripted records of oral history interviews conducted with the Villines family.

Clyde Villines, the last miller of Boxley, was interviewed by Kenneth L. Smith in 1960. J.D. Villines, son of Clyde Villines, was interviewed in July, 1986 by Suzanne Rogers.

Character Defining Features

The Secretary of the Interiors Standards for Rehabilitation state that "The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features or spaces that characterize a property shall be avoided". To that end identification of those elements that provide a structure with its character is essential to preserve important features which may become lost or damaged over time, or in the process of change. Character refers to all those visual aspects and physical features that comprise the appearance of a structure. Character defining elements include the overall shape of the structure, its materials, craftsmanship, decorative features in addition to aspects of its site and landscape context.

Site Features: Overall significant features of this property are associated with the operational period of the mill. They include the mill structure itself and its relationship to the Mill Creek and its tributaries, and the Buffalo River. Also included are the Mill Pond (and its source if included in the park boundary), the head race and the earthen head race berm, the wooden sluice gate, the extant portions of the stone masonry and concrete flume with its rubble stone base, the concrete turbine forebay, the turbine box, the tail race, and the stone retaining wall which defines the tail race (Ill. 9).

Integral with the accoutrements of the mill are the open fields around the structure, the lane in from Arkansas Highway 43 which extends to the NW elevation of the mill, and the fence lines which define land use patterns and property limits.

Structure Features - Exterior: The character defining elements include the siting of the structure and many of the external building components. These include the overall scale and building massing, the gable roof and later frame addition; the wood frame structural system and stone pier foundation; the box cornice and returns, box eaves, and other exterior architectural trim including
the corner boards, and door and window trim; the split and sawn wood shingle roof; the textural sawn (and resawn) clapboard siding; the 4 over 4 double hung sash; and the board and batten doors and hardware.

**Interior:** These character defining features are associated with the open and unfinished nature of the mill interior. The exposed primary and secondary structural systems, and other interior features such as the rough sawn quality of the interior face of the exterior siding, the exposed floor and roof framing systems, the open stairs, the unfinished floors, etc.; these are all contributing character defining elements.

Another aspect of the interior space is the definition of the circulation and work areas within the mill. The definition of the interior space is achieved primarily through the placement of the historic milling equipment and storage bins. The equipment and its correct layout becomes a primary feature on the interior of the mill and perhaps the most significant interior character defining feature of the structure. These components include the milling equipment, the vertical elevator system, the bin system, as well as the power transmission system, i.e., the turbine and turbine drive shaft, bevel gears, tensioner and tensioner belts, the millstones and hurst frame, the main drive shaft, etc. The inventory and identification of these elements was begun in the Historic American Engineering Record drawings of the mill.
III. PHYSICAL HISTORY and FABRIC INVESTIGATION RESULTS

Historical Overview

The discussion presented in this section is based on the examination of physical evidence existing within the structure. The conclusions are drawn from analysis of details of building technology and construction methodology tempered by what is known of the history. Comparisons between different types of hardware, and discussion concerning framing components and architectural details in this section represent a general knowledge and familiarity with structures of this type, although not specifically mill buildings.

There have been many assumptions made concerning the date of the initial construction of the mill. Most of them target the 1870's as the most likely time of construction. Local history verifies the existence of a mill in the Boxley vicinity by this time. The Classified Structure Field Inventory Report of November 1983 goes so far as to specifically identify the period of construction as, "Historic (ca. 1873)". 16

There was no evidence uncovered during this investigation to confirm or pinpoint an actual construction date. All of the existing construction fabric could certainly be of the 1850's or later era.

This can be verified based on timber frame construction techniques, machine cut nails, and the number of times the roof and siding has been replaced.

Initial Construction

A specific initial construction date can only be established through historical and archeological research, including dating of the milling equipment, which still needs to be completed.

According to local history and an early federal land survey, a small mill was located in the same area or possibly even on the same spot as the existing structure.

Noted local historian Kenneth L. Smith writes in his book The Buffalo River Country that, "By 1850 the settlement (Boxley) had grown large enough to support a grist mill on the stream from the big spring just north of Boxley. Samuel Whiteley's water mill

served as a neighborhood center...".  He continues, "Samuel Whiteley's grist mill continued in use for a few years after the Civil War (local skirmish 1863-4), but by 1870 the community needed and demanded a larger mill. In that year they put up a two story frame building and Robert Villines became the miller".  

This account seems to be confirmed by that of Walter F. Lackey. He writes in his History of Newton County, Arkansas:

The old water mill, first built by Abner Casey, below the Boxley Springs was a Godsend to the early settlers of the upper Buffalo River Valley. Abner Casey, Sr., born in South Carolina in 1786 was an experienced miller before coming to the Buffalo River Valley about 1840.  

Lackey says earlier in his book:

Abner Casey, Sr., a miller born in South Carolina in 1766...settled near Boxley sometime before 1850...records do not indicate whether Mr. Casey operated a water mill or was a retired miller from South Carolina.  

Oral tradition notes that Abner Casey sold the mill to Samuel V. Whiteley, date unknown. This could account for the discrepancy of the name of the original builder in these two reports.

In Suzie Rogers', Brief and Informal History of the Boxley Mill, which was prepared in July 1986, she notes:

In 1845, the federal surveyor noted Casee's mill as 18 or 20 chains West of a line between Section 2 and 3, which according to recent plotting would not be the immediate site of the present mill, though in the vicinity. The present mill site was labeled in 1845 as 'Casee's cane pasture'.

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20 Kenneth L. Smith. Pg. 84.

21 Walter F. Lackey. Taken from the first census of Newton County, Arkansas, 1850.

22 Walter F. Lackey, pg. 652.

No physical evidence was uncovered during this investigation to indicate an earlier structure. This included identifiable recycled materials from said structure, "Casee's Mill", on the present site.

Local history seems to indicate that the existing structure was either constructed in 1870 or in the next few years. In his History of Newton County, W. F. Lackey writes:

By 1870 several families had established homes in the valley. This brought a need and a demand for a larger grist mill. Soon, thereafter, men of the community employed a man by the name of Miller to build a large, two-story frame building and Robert Villines became the miller. 24

Later Mr. Lackey writes:

James Larkin Villines, [son of Robert and Matilda C. (Whiteley) Villines] who is now 87 years of age, is in good health and very active. From his front porch he can see the old water mill that was built in 1870. 25

Development and Change

The present structure appears to have gone through a period of major change sometime during the late nineteenth or early twentieth century. The Boxley Valley area was flourishing between the years 1860 and 1940 as homesteaders and land speculators moved into the area. In fact,

The population of Newton County in 1850 was 1711. The largest enumeration Newton County ever had was in 1900. The enumeration at the time was 12,538". 26

With this steady increase of the surrounding population the demand for facilities to grind corn and process flour was likely outstripping the old mill's capacity. While there was at least one other mill in operation in the area, at Henson Creek 27, the opportunity for increased production probably spurred the Villines' into making some equipment changes.


At the turn of the century, new and imported milling equipment may have been somewhat easier to find than in the 1880's and 1890's. About this time (1890-1900) the Boxley Mill was retrofitted with a new undershot cylinder gate tub-type turbine system. This would have replaced the traditional segmental waterwheel which was still in use at the site, and allowed for increased production.

At this time it is not possible to determine precisely what type of water wheel existed at the site. W. F. Lackey remembers, "A large under-shot turbine with plenty of water from the Boxley Millpond Spring...". 28 This could refer to the later tub turbine as it is not clear to what date Lackey is speaking.

Kenneth L. Smith mentions that the waterwheel was lacking when he talked with Clyde Villines in the late 1950's. He mentions the wheel, but not specifically what type of wheel. 29

Several years later in an unpublished manuscript also written by Kenneth L. Smith, there is more information on the waterwheel. Smith writes, "...The mill (which) at first had a picturesque overshot waterwheel was the industrial center of the valley". 30

Charles Howell, a fifth generation miller and retired millwright of some 30 years and master miller of the Philipsburg Manor Grist Mill at North Tarrytown, New York was brought in by the Southwest Region to examine the mill and its contents in the summer of 1986.

In his preliminary inspection report of July of that year Mr. Howell remarks, "The water wheel was probably overshot, about 10 feet in diameter and four to five feet wide". 31

This question of the type of wheel the mill was originally outfitted with cannot be answered given the present level of research. However, Mr. Howell's opinion is the most plausible at this time.

28 Walter F. Lackey, pg. 283.
No matter what type of wheel, the change to the tub turbine enabled the miller to operate the mill with considerably less head of water than the wheel. Given the fluctuations of the water level of the Buffalo River and the Mill Pond during summer months, it was not uncommon to have to shut the wheel-driven mill down after five to six hours of running due to insufficient water. Being able to run on less water increased the efficiency of the mill and most likely enabled the Villines' to increase their production capabilities significantly.

It is possible to ballpark dates of changes using the milling equipment which still exists. Mr. Howell has dated the cylinder gate tub-type turbine around 1890. He reports, "There are no marker's name(s) on the machine, but (it) appears very much like a 'Rome' turbine which was manufactured in Georgia. This turbine was probably installed in the 1890's when the roller flour system was fitted" (Ill. 10 and 11).

Physical evidence seems to support this statement; there is an inscription in the mortar of the masonry pier below the main drive shaft from the turbine. This inscription, which reads "1901", would tend to verify this general timeline of development at the mill. It's quite possible it took 10 years for engineering advances of this type to reach the rural agricultural areas of Arkansas (Ill. 12 and 13).

The installation of the turbine required the raising of the first floor approximately 16 inches to allow the drive shaft from the turbine to operate. The above mentioned pier was probably constructed at that time. This raising of the first floor level most likely prompted further alterations to the earlier door and window openings at a later date (Ill. 14 and 15).

Another clue which may possibly offer a date on the window and door alterations to the structure was found during the physical investigation. On the interior face of the southeast elevation of gable window W302 can be found another marking. Written in faded pencil is the date "August 2, 1914", with a word preceding it which possibly reads "window". Although this date and the area that it is written on cannot be taken as certain evidence in relation to a major rehabilitation, it is nonetheless, a possible date for renovation work.

This takes into consideration the expected 45 years +/- for the projected life cycle of building materials starting with a construction date sometime in the early 1870's. (Before replacement is needed).

32 Charles Howell. Pg. 2.
In summary, given a construction date circa 1870, forty years should be allowed as the life cycle replacement time on materials such as roof shingles and generally on painted wood, etc. The 1914 date found on the gable window seems to indicate an acceptable time period had passed before replacement of worn parts became necessary, especially for a structure which was heavily used.

Several factors seem to indicate that the exterior siding was replaced following the relocation of window and door openings.

Physical evidence remains in the infill stud framing of the walls which suggests there were many smaller window openings than currently exist. These openings were covered over with the second generation siding. This condition still exists and can be seen in the HAER framing plans and the interior photographs (Ill. 16 and 17).

The replacement of the exterior siding after approximately forty years is also consistent with the weathering cycle of other materials. Given the scope of the overhaul at the mill, the owners may have opted for wholesale residing and reroofing, including a new cornice line, in conjunction with relocating doors and windows. This was associated with the conversion from wheel power to turbine power and the changing of the first floor level.

Illustration 12. Boxley Grist Mill; View of Pier Behind Turbine Box on Southeast Elevation With 1901 Inscribed Into Mortar of Pier.

Illustration 13. Boxley Grist Mill; Detail of 1901 Inscribed Into Mortar of Pier.

Illustration 17.  Boxley Grist Mill; Interior Detail of Door 201 Framing.  Note battens cut off opposite hinged side, two studs headered off, and plank added to widen door frame.
IV. EVOLUTION of CONSTRUCTION

The following is a brief chronology of the changes made at the Boxley Grist Mill based on the physical analysis of the existing structure. For key to Door and Window opening numbers, i.e., D101, W 201, see Illustrations 22 - 25.

1870's

The initial construction of the two story transitional wood frame building was completed as it exists, with the following exceptions:

1. The first floor level was approximately 16 inches lower.

2. The first floor had four smaller window openings each on the northeast and southwest elevations, and two on the northwest elevation. The door (D103) was in its current position on the northwest elevation. These findings are based on matching smaller hewn openings that exhibit earlier square nail patterns, empty mortise pockets in the top and bottom plates, and missing hewn studs replaced with circular sawn members alongside the existing, wider windows.

3. On the second floor there were two windows each on the southwest, northeast and northwest elevations. This is based on the same evidence as the first floor. It must be noted, however that the hewn studs framing the opening on the west side of the northwest elevation have no nail patterns identifying an earlier window application. The southeast elevation has no evidence of openings on the second floor level (Ill. 18, 19, 20, and 21).

4. Gable end windows: Based on the existing framing and the lack of early nail patterns, it is not possible to determine if the gable windows (301,302) are of the earliest construction period of the mill or if they were inserted at a later date. The existing rough opening frames could have easily been louvered ventilators which were later changed to sash.

1880 - 1900

1. D102: The sawmill door was added on the southwest elevation. The existence of a sawmill at the mill site has been verified by at least two taped interviews.  

33 Upper Big Buffalo Area, Boxley Valley, Oral History Project, Phase II. Center for Ozarks Studies, Southwest Missouri State University, Springfield, Missouri. Interview of Nellie Villines by Flanders, Morrow, and Liles, June 7, 1984, transcribed
Illustration 18. Annotated Framing Plan Southwest Elevation With Notes As To Earlier Window Locations, Boxley Grist Mill.
Illustration 19. Annotated Framing Plan Northwest Elevation With Notes As To Earlier Door and Window Locations, Boxley Grist Mill.
Illustration 20. Annotated Framing Plan Northeast Elevation With Notes As To Earlier Window Locations, Boxley Grist Mill.
Illustration 21. Annotated Framing Plan Southeast Elevation, Boxley Grist Mill. Notes by William Hose, NPS, WPTC.
It seems likely that the sawmill operation was out in front of the mill on the flat ground. A drive belt was run from the main drive shaft to the saw mill mechanism. It is possible that D102 was cut through to allow a drive belt to be run out to the sawmill. J. D. Villines (Clyde's son) has said he remembers the sawmill from, "...his grandfathers days or earlier" \(^{34}\) (Ill. 22).

James Larkin Villines (b.1862-d.1956) was J. D.'s grandfather. His most active years at the mill were probably from 1880 through 1922. The sawmill most likely dates to years in this time period. In speaking with Kenneth L. Smith in 1960, Clyde Villines says the sawmill disappeared more than 60 years ago. \(^{35}\) This statement limits the sawmill to an earlier time period, possibly to the years 1880-1900.

Regardless of the exact date of construction, it seems apparent that there was a saw milling operation for a period of years. Whether any of the material in the mill was sawn at the site it cannot be determined. No evidence was found to prove or disprove this and the sawmill certainly could have produced the lumber used for the alterations.

\textbf{1900 - 1914}

1. Installation of the turbine required that the first floor be raised 16 inches. This made the earlier windows too low, and possibly some windows weren't working out with the reorganized milling operation and the location of the newly installed equipment.

2. New, larger double hung, 4 over 4 wood frame windows were installed in the present configuration. The side door on the first floor, (D103) northwest elevation, was added and the second floor door (D201) was made smaller by approximately seven inches. These alterations are evident by the addition of circular sawn studs and their fastening with wire nails, also the interior trim boards do not line up.

These changes and the possible weathered condition of the initial siding may have contributed to the application of new siding on this elevation.

3. Exterior siding was totally replaced, covering some of the initial window openings.

\(^{34}\) Suzanne Rogers. \textit{Taped Interview With J. D. Villines}, Reel 2, Tape Log #3189, Buffalo National River, Harrison, Arkansas, May 9, 1986.

Illustration 22. Boxley Grist Mill; Detail of Door 101 and Door 102 Showing Cut Sill Plate at Door 102, 1986.
4. The initial wooden roof shingle system was extensively repaired or replaced, and the roof extended over the gables to its present overhang. It seems most of the first generation sawn roof sheathing was retained.

5. The present cornice was installed as an extension from the rafter tails.

6. The entire exterior of the building was most likely treated with the existing red paint. NOTE, the northeast elevation, or rear, of the mill has no physical evidence existing that it, or any of the trim, was ever painted. Paint investigation notes were recorded on copies of the HAER building elevations (Ill. 23, 24, 25, and 26).

1915

1. Major flooding occurred along the Buffalo River.

1920's

1. The wood frame addition, or so called miller's office, was most likely added on the southeast elevation. This was probably within five to ten years after the mill was painted. Judging from the weathered paint in this area, still evident on the protected siding boards at the office addition, this section was exposed to the environment for only a short period of time prior to being enclosed within the frame addition.

1930's

1. "The millpond was drained and enlarged in the 1930's and the concrete race was built". The concrete portions of the flume, or millrace, were improvements to the existing rock and mortar system. They must date from at least the installation of the turbine, if not earlier, and were constructed by Robert Villines.

Certain portions of the concrete construction nearest the mill seem to relate directly to the operation of the turbine. The turbine box and the head race leading to it are cast as a single concrete element, there is no cold joint between the two members. The concrete flume, forebay and turbine box appear to be secondary improvements to an earlier system. This system was rock and mortar with some wooden elements. It provided water first to the wheel and then later to the turbine (Ill. 27).

36 Suzanne Rogers. *A Brief and Informal History of the Boxley Mill, Also Known as the Whiteley Mill.*
Illustration 23. Annotated Southwest Elevation With Paint Survey Notes, Boxley Grist Mill.
Illustration 25. Annotated Northeast Elevation With Paint Survey Notes, Boxley Grist Mill.
Illustration 26. Annotated Southeast Elevation With Paint Survey
Notes, Boxley Grist Mill.
Illustration 27. Boxley Grist Mill; View of Concrete Millrace and Southwest Elevation. Pre-1959 photograph showing wood shingle roof still exposed; note stone foundation and wooden braces of concrete raceway.
1950's

1. Major flooding in 1951.

2. Corrugated metal roof sheeting is installed over what is thought to be the second generation wood shingles as the roof system deteriorates. Photographs taken in April of 1959 by Kenneth L. Smith clearly show the metal has been added across the lower third of the southwest side of the roof. Photo Number 3 by Smith shows a good view of the roofing (Ill. 28).

3. By April of 1959, a few segments of the stone portions of the millrace had collapsed and regular operation of the mill ceased. This collapse dislodged several sections of the concrete millrace walls. The mill must have been closed by this time since water could not reach the turbine due to the broken walls in the deteriorated millrace. Photo Number 11 by Smith has a good view of this (Ill. 29, and Ill. 30).

The photographs would seem to be irrefutable evidence, however; an article in the Ozarks Mountaineer circa July 1959 by Steele T. Kennedy indicates differently. "...We could hear the water still rushing along the millrace outside and with all the parts in such good state of preservation, we asked why the mill had ceased operating". 

Possibly the date recollected by the author of the Ozarks Mountaineer article was wrong. The 1959 photos by Smith clearly show the millrace wall out of alignment with large gaps between segments.

By this time the millrace was definitely in poor shape. Smith notes in his commentary for Photo No. 11 (Ill. 29), "...Water is flowing through the screen (of wood slats) to discharge through a collapsed portion of the flume just beyond".

1960's

1. The concrete millrace is "wiped out" by the flooding Mill Creek in 1961 as reported by J. D. Villines to Suzie Rogers in 1986.

2. Metal roofing is added on the upper roof slope after shingles become deteriorated. Some shingles are removed and wood furring strips added. Shingles under the lower roof metal remain at the eaves.


26
Illustration 29. Boxley Grist Mill; The Flume From the Pond to the Mill With the Mill in the Background, 1959.
Illustration 30. Boxley Grist Mill; Southwest and Southeast Elevations Showing Early Wood Shingle Roofing Partially Covered with Metal Sheeting, Also Millrace Is Collapsed, circa 1959.
1970's

1. By 1970, newspapers reported the total demise of the millrace,
   The rock and mortar millrace had fallen apart between the lower end of the pond and the millrace... 38

1984

1. The National Park Service implemented pre-ownership emergency stabilization measures.

1986

1. Phase I Stabilization carried out by National Park Service preservation crew. This included placement of interior cribbing, implementation of structural bracing followed by sill plate replacement on all elevations except Southeast. New floor joists were placed under roller mill. Realignment of structure.

1987

1. Documentation by Historic American Engineering Record (See Appendix 7).

2. Phase II Stabilization implemented by NPS Preservation crews included completion of sill plate installation, structural epoxy and fiberglass reinforcing rods were used in strengthening of secondary structural members. Mortise and tenon joints were reinforced with steel plates, hurst frame was also stabilized.

V. INDIVIDUAL BUILDING COMPONENTS

This section presents an analysis of the major building components of the mill. Clues about the chronology of construction and later changes to that structure can be found by reading the building.

This evaluation does not include replacement or supplemental material which was installed as a result of the Phase I or Phase II projects. Documentation of this work is found in the completion reports for these two projects. 39

As part of the effort to document the building during the summer of 1986, the Division of Conservation hired Historic Structures Consultant, Mr. Jeffrey L. Brown from Wellesley Hills, Massachusetts to help assess the integrity of the mill. The first three pages of Mr. Brown's report give a brief description of the structural system. His findings are an appendix to this report.

Timber Framing

All of the hand hewn timber framing components appear to be original to the present structure with the exception of the joists. These were added to raise the first floor.

All original framing members required to carry any load are either red or white oak, or elm. Cedar is also used but is limited to rafters and nonstructural infill wall studs. Used as nailers for the siding, all framing members display characteristic hand hewn tooling marks.

The framing system itself does not display master quality craftsmanship as is evident in the poorly fitted mortise pockets for the diagonal bracing and the upright hewn studs. When one considers the utilitarian nature of the building, this level of craftsmanship is not unusual. The mortise pockets in the top and bottom plates were cut out on the ground to a standard size, and the bottom plate set in place during construction.

39 Douglas C. Hicks. PHASE I Boxley Mill Stabilization, Completion Report and Project Record, Division of Conservation, Southwest Cultural Resources Center, National Park Service, Santa Fe, New Mexico, 1986.

Barry T. Caldwell. PHASE II Boxley Mill Stabilization, Completion Report and Project Record, Division of Conservation, Southwest Cultural Resources Center, National Park Service, Santa Fe, New Mexico, 1987.
The small diameter studs were cut from the stump, hewn flat on two sides, and then randomly placed in the bottom plate mortise pockets without custom fitting. The top plate was then set and the studs wedged tightly into place. The loose fit allowed this type of construction and sped up the framing process.

The structure also lacks rafter coffins where the rafters seat at the eave line. Usually the rafter plate would have been notched out using a wedge shaped surface mortise pocket. The squared off edge of the rafter tail sits in this pocket and is fastened with a spike. Coffins are common in quality timber framing of that era. Instead, rafters are seated directly on joists and nailed only with 30d cut nails. (See roof details, sheet 14, HAER drawings) These nails do have an unusual square pattern stamped on their heads, which may help in dating the original construction. All of the initial timber framing is fastened either with mortise and tenon joinery and wood pegs or manufactured cut nails.

Nails

The existing siding, cornice, windows, and doors, are all fastened to the frame with wire nails. Wire nails can be used to help sort out the construction chronology.

As a generalization, the presence of wire nails indicates late nineteenth century repairs, alterations or maintenance, and to that extent, they are useful dating tools... Wire nails did not really become the dominant type (used) until the 1890's, and many builders preferred using cut nails well into the twentieth century.

It cannot be determined without further in-depth research at what time this type nail actually became available in the Newton County vicinity. Suffice it to mean the presence of these nails indicates repair or replacement work completed 30 to 40 years after original construction. Physical evidence points out that square cut nails were used in the original framing episode.

Siding

During Phase I and II stabilization work, siding was removed from all elevations to facilitate the installation of the temporary pipe bracing system. In some cases replacement of existing deteriorated siding was necessary.

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All exposed framing members exhibited evidence of earlier siding. This was verified by the presence of square nail holes in the framing system. No first generation siding was discovered. All of the existing siding (second generation) is fastened with wire nails and was circular sawn.

Further evidence that the siding, etc., is of the second generation is based on the existence of square cut nail holes in the wall studs, corner hosts and roof sheathing. This is visible only after prying off the elements fastened with wire nails.

There was no original (first generation) siding or wood shingle fabric discovered either in Phase One or Phase Two preservation projects, or during this investigation. It was determined that the existing sections of wood shingle roofing area which were examined are second generation. This determination is based on the weathering of exposed portions of the shingle and evidence of round headed nail hole patterns. No examination was made of any shingles in the ridge area of the roof. Careful evaluation of shingles and nails found in this location may indicate first generation shingles.

The replacement siding installed by Williamsport Preservation Training Center during the Phase II work in FY 87 is the third generation of siding to go up on the building. It is of the same species as the second generation, i.e., Southern Yellow Pine, and was fabricated in a manner to match the remaining existing second generation siding.

The second generation siding was rough sawn by a circular saw method known as the resaw method. The replacement siding was also fabricated by a circular resaw method. "Resaw" means that instead of manufacturing boards which are sawn and then surface or planed,

41 Southern Yellow Pine, (Pinus SPP). SPP stands for "species". In the case of Southern Yellow Pine...several species are grouped together for commercial purposes and sold as a single commodity in the U. S. lumber markets.

The term, "yellow pine", comes from the tendency of the sapwood and heartwood to be yellow or reddish-yellow in color. Of the 10 species, four are considered to be principal woods: pinus taeda (l., loblolly pine); pinus echinata (mill., shortleaf pine), pinus elliotti (englelm., slash pine); and pinus palustris (mill., long leaf pine).

Dr. Marshall S. White. Wood Identification Handbook, Commercial Woods of the Eastern United States, School of Forestry and Wildlife Resources, Department of Forest Products, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 1980, pg. 32.
on one or both sides, these siding boards were sawn on both face surfaces. This method leaves circular saw marks on both faces of the siding and matches the older existing second generation siding.

The original siding application was fastened with cut nails. It appears that it was installed at the same exposure as the existing siding. This is based on the spacing of nail holes and their patterns in the framing members.

Box Cornice and Eaves

The existing cornice took its present form in conjunction with the installation of the second generation siding. Other than nail patterns, nothing can be determined as to what the initial configuration of the cornice looked like, at least on the gables.

The eave overhang does not appear to have been altered based on the existing fabric. The gables have outlookers which are circular sawn while the rafters themselves were hand hewn. Also, the outlookers are fastened with wire nails (typical of all other alterations) while the rafters are connected with earlier square nail types. The Cornice Detail of Rake, and Cornice Detail of Eave drawings by HAER indicate this construction (Ill. 31).

The original "flitch sawn" 42 sheathing stops at the plane of the gable wall and a circular sawn sheathing board runs perpendicular to the originals over the outlookers.

This evidence implies the cornice return on the gable elevations is a later addition. Again, all existing fabric is fastened with wire nails whereas the original was fastened with cut nails.

Windows

It appears the initial window configuration underwent a period of major change at the same time the present siding was applied. None of the existing pine frames or sash are of the initial construction, based on machine marks and nail fasteners. There is considerable evidenced of earlier window openings in the hewn stud walls. Evidence present in the wall framing also indicates that

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42 A "flitch" is defined as, "... a portion of a log sawn on two or more faces - commonly on opposite faces, leaving two waney (bark covered) edges. When intended for resawing into lumber, it is resawn parallel to its original wide faces...the term is loosely used". Wood Handbook, Wood As An Engineering Material, AG. Handbook No. 72., Forest Products Laboratory, US Forest Service, revised August 1974, Pgs. 23-4.

31
Illustration 31. Cornice Detail of Rake and Eave showing construction of outlookers to support soffit and fascia.
there were more window openings but they were of a smaller size, at least in width.

Based on physical evidence, the initial rough opening averaged 30 inch x 52 inch, and appear to have been installed an average of 32 inches from the finished the floor level. When the present windows were installed, hewn studs supporting the early windows were removed and circular sawn studs installed to accommodate their greater widths and provide greater structural support.

Concerning the question of sash configuration, it is possible that the initial openings were only framed and shuttered with no glazed sash in them. There is no evidence one way or the other, but it is worthwhile mentioning as this is found regularly in Ozark utility type structures.

All existing sash appear to be of the same relative installation period. The windows are all constructed of pine (frames and sash). The frames exhibit both circular saw and hand plane markings. Sash are all the same type (4 over 4 double-hung) and appear to be factory manufactured (Ill. 32).

The frames could have been fabricated on site, and they have been assembled using wire nails.

Sash which were originally installed in reverse position were returned to the position in which they were found.

It should be noted here that some of the window sashes found at the mill had been historically installed both upside down and inside out, and severe weathering of the sashes indicates that they were that way a long time. As such, sashes were (re)installed the same was that they were found in order to maintain the historical integrity during this stabilization phase of work at Boxley Mill.\(^{43}\)

There is no physical evidence of sash in the early frame openings discussed earlier.

Glass

The Phase II Completion Report indicates that historic glass was found intact only in the northeast (rear) elevation. Six pieces were found and reinstalled to the location in which they were found. These positions are noted in the glass schedule which is a part of that report (Ill. 33).

Illustration 32. Boxley Grist Mill, Detail of Window 204, Southwest Elevation.
Illustration 33. Annotated Northeast Elevation With Notes Concerning Locations of Historic Glass Window Lites Found.
Doors

It appears that the existing doors on the northwest elevation (D103 and D201) were part of the initial construction. Door D103 exhibits no evidence of change from the original installation (Ill. 34).

D201, however, has undergone an alteration to make it smaller. This occurred during the time of the application of the second generation siding. This is evident in the scabbed circular sawn filler studs located in the opening and fastened with wire nails.

Neither of these doors are of the first generation of construction. While D103 has survived the years of change at the mill without change in its size, D201 has been recycled. Physical markings on D201 clearly point this out; there are ghost marks from an earlier hinge application on its interior face and on the exterior side the ghost of some painted letters can be seen (Ill. 35, 36, and 37).

These letters reading "SHUT THE D(OOR)" appear inverted from the ground level, leading to the conclusion that the door was rehung in an inverted manner. Further evidence of reuse is indicated by the last three letters (OOR) having been cut off the existing door. This seems to indicate the door used to be wider than it is now.

There is no evidence of doors on the northeast elevation.

D104 on the southeast elevation is an obvious alteration. This is evident by the circular sawn stud framing members and wire nail fasteners. It was most likely installed when the office addition was constructed.

D105 was cut into the building during the installation of the historic second generation siding and its markings are contemporary with those of the window frames. It may have existed initially as a smaller inspection door for the waterwheel. It is more likely that the opening was made to allow access to the shaft controls of the tub turbine.

It is difficult to determine if door opening D101 is original to the construction of the mill. Due to many alterations on the southwest elevation most evidence of first generation fabric has been removed. Fabric which supports this theory are the mortise pockets which line up with the initial window opening size, but which are lacking studs.

D102 is a later addition. Its construction weakened the sill timber when it was cut through. As mentioned in the discussion for Evolution of Construction, 1880 - 1900, there is evidence a small sawmill was in operation at the mill for a number of years. It is suggested that the sill plate was cut to accommodate a sawmill drive belt link-up with the main drive shaft of the mill.

Roof

The existing wood shingles under the metal roofing are of the second generation. Measuring 26 inches long on the average, and three to six inches wide, they are hand riven to between 3/8 and 1/2 inch thickness at the butt end. All those inspected were red oak, fastened with 6d wire nail and had eight inch average exposure to the weather. On the southwest eave there is a three to four inch extension past the face board, this is repeated with a six to seven inch extension at the northeast eave. All shingles are severely weathered.

Based on existing nail patterns found on the historic sheathing, the earlier (first generation) application of shingles had a ten inch average exposure and appear to have been the same widths as the existing application. No first generation fabric was found.

Although no flitch sawn sheathing boards were removed in the limited roof inspection area, it does appear to be first generation fabric based on the cut nails attaching it to the rafters. The cedar pole rafters also appear to be first generation.

The corrugated metal roofing is nailed to 1 x 4 sheathing boards (lath) which are nailed over the remaining first generation shingles. The shingles are nailed over the flitch sawn sheathing boards. The 1 x 4 lath acts as nailers for the metal roofing and creates a lateral "diaphragm" bracing system (Ill. 28).

Efforts made to realign the roof system during Phase II work met with structural resistance most likely created by the lateral stability of metal, lath, rafters and sheathing boards being fastened together. Since the lath and metal roof sheets were put on with the building in an out-of-plumb condition, the roof system is "locked" in place until the metal and 1x4 lath is removed. When the sheathing is cut out than the rafters can be realigned.

Paint

There appears to have been only one application of paint to the structure. This has been determined by analysis of paint samples removed for this purpose, and is discussed in the Appendix No. 1.

Closer study is needed before a specific paint can be identified. It does appear though that the structure was painted with a red oxide type of paint. Limited evidence indicates the entire building was painted with the exception of the northeast elevation and possibly certain other components. Time did not allow a thorough study of painted or unpainted areas during this trip (See notes on elevations pertaining to paint schedule, Ills. 23, 24, 25, and 26).
Weather Hood @ D201

No additional physical evidence was uncovered pertaining to this element. The material still in place was examined and it appears to be the remains of a pent (shed) roof which overhung the northwest elevation. The door was probably installed during the siding application.

This is based on fabric condition and the April 1959 photo by Kenneth L. Smith which clearly shows the collapsed roof with its wood shingle covering (Ill. 28).

There are no known photographs of this elevation with this element pictured intact. It is not possible to determine the age or original configuration of this element due to the lack of evidence at this time. Any reconstruction of this element would be speculative given the current information (Ill. 38).

Wood Frame Addition - "Miller's Office"

Although an exact date cannot be determined for the construction of this addition, evidence does show that it was added after the red paint was applied to the southeast elevation. Judging from the weathering of the existing paint it appears that it was constructed not long after the paint application, possibly within 5 years. This puts the construction of the addition in the mid 1920's.

Much of the fabric has deteriorated and the southeast side is completely gone. All extant materials are circular sawn and fastened with wire nails. The window (W100) exhibits the same characteristics as the windows in the older main building.

W100: This window exhibits evidence that it was once part of the main structure. It can be inferred that D104 may have originally been the window opening housing W100. When the "millers office" was constructed the window was enlarged to accommodate this door (D104) and the existing window (frame and sash) was reused on the Southwest elevation of the frame addition, now W100.

W100 is located in the southwest elevation and still exists. There is also a connection door (D104) between the mill and this structure. D104 dates from the construction of the frame addition, circa mid 1920's.

The frame addition was documented in the early phases of stabilization:

Added onto the first floor level of the southeast elevation is a 12' x 6', one story, wood frame addition with a shed roof...The structure of this addition consists of a simple dimensional lumber frame with
vertical board and batten siding and a wood board and batten shed roof".44

Only at the southeast elevation is there not enough remaining physical evidence available to determine its exact appearance without some level of conjecture. However, recently enlarged historic photos show some evidence of a board and batten wall without any openings (Ill. 39).

Illustration 38. Boxley Grist Mill, Southwest and Northwest Elevations With Remains of Weather Hood at Door 201, Wood Shingle Roof Covered Over With Metal Sheeting. Photograph dates later than 1959 since roof is completely covered with metal sheeting.
Illustration 39. Boxley Grist Mill, Southwest Elevation With Mill Race in Foreground, Wood Shingle Roof Exposed. Photograph dates earlier than 1959 since wood shingles are completely exposed. Photo shows Clyde Villines (left) and another man. They are perhaps working on the mill race.
VI. PRESERVATION ALTERNATIVES -

Preliminary Design Recommendations for Continued Exterior Preservation

Overview: This section is organized to address concerns regarding the preliminary design for exterior preservation issues at the mill as outlined in the Task Directive between the Southwest Region, Division of Conservation and WPTC. It specifically discusses these concerns in terms of the four major areas remaining to be dealt with for the preservation of the structure. These areas are:

A. Restoration of the Roof System;
B. Exterior Finish Treatment of the Siding;
C. Treatment of the Doors and Windows;
D. Missing or Incomplete Architectural Features;
   I. Wood Frame Addition, Miller's Office;
   II. Northwest Entrance Porch & Weather Hood @ D201.

The components presented below (numbered 1-4) come directly from the Task Directive. They satisfy these concerns by recommending steps for treatment, i.e.; preservation, rehabilitation, restoration, etc., and discussing the basis for such recommendations. This process is also an analysis of the impact of the proposed action on the structure.

Each lettered section (A. Restoration of the Roof System) is followed by a brief discussion of existing conditions as they represent visual qualities associated with the mill. Following this, the text is set-up in an outline format which is organized according to the below listed Component Treatment Issues.

Component Treatment Issues

1. Analysis of the effect of continued exterior preservation on the character defining features of the building and site.
2. Description of the basic exterior preservation approach with appropriate treatment alternatives.
3. Recommended treatment and Statement of Effect as per the application of the criteria of adverse effect.
4. Preliminary design development drawings and outline specifications.
A. RESTORATION OF THE ROOF SYSTEM

Existing Conditions: The current corrugated metal roof has a very defined pattern which can be associated with deteriorated buildings throughout the Ozark region. Standardized three foot by ten foot (3' X 10') sheets of ribbed corrugated metal are nailed to a 1 inch x 4 inch wood lathe system. These sheets are laid out in accordance to the overall configuration of the building. In the case of the rectangular gable roof on the mill, the sheets are arranged in two parallel rows, one above the other, per side of the roof. Each row consists of nineteen (19) sheets running west to east, with the eastern edge of each sheet being overlapped by the leading western edge of the next sheet.

Due to the chronology of the replacement roofing, the lower row appears to be older than the upper row. The characteristics it exhibits are those of well worn, and perhaps previously used, sheet metal roofing; i.e., oxidized to a warm rust orange/red color, ragged and torn edges, with a very thin cross sectional area which allows the metal to conform to the humps and hollows of the roof framing system.

It should be noted this material has been renailed several times in an attempt to prevent it from blowing off the building and therefore is riddled with holes. Several lengths of 2 x 4 have been nailed over the lower edges to prevent uplift of the metal along the eaves.


Concerning the roof, continued preservation is not a viable solution. Although in a relatively good condition in terms of shedding water, the lifespan of the existing metal has surpassed its usefulness. This material has not been maintained and is at the point of diminishing returns, the roof framing system requires attention and cannot be properly repaired without dismantling the existing roof. Although there is an argument favoring preservation of the existing roof to maintain its certain visual qualities, the preservation of the entire building is dependent on a good roof, and should override the visual concerns.

A2. Treatment Alternatives

Regardless of which system is selected for the final surface treatment of the roof, the roof framing system must be addressed as a separate matter. Rafter plates along the Northeast and Southwest elevations must be inspected for structural integrity. A determination must be made as to the extent of work they require in order to meet the loading provisions established by the structural engineer. Rafters need to be upgraded as per structural
engineer's recommendations. Roof sheathing may need to be replaced in certain areas.

a. Remove existing metal roofing, save sheet metal panels, install functioning roof system over flitch sawn or plywood sheathing (rubber membrane system or roll roofing)¹, reinstall existing corrugated sheet metal panels as false roof over functioning roof. Treat existing sheet metal panels with oxidizing sealant.

b. Replace existing corrugated sheet metal roof system with a similarly configured prefabricated sheet metal system.

c. Replace existing sheet metal roof system with an historically accurate wood shingle roofing system.

A3. Recommended Treatment

Replace existing sheet metal roof system with an historically accurate wood shingle roofing system.

Statement of Effect: Changing the roofing material to a wood shingle roof system will result in two major visual changes other than the obvious change from metal to wood. Scale and texture, which can be described as visual character defining elements, will be somewhat altered.

The scale of the roofing material will change from that of one which has a very defined rhythmic pattern (metal sheets) to that of a more homogeneous mass (wood shingle). Since the shingles are smaller, on the average 3 to 6 inches wide with 8 inches to the weather, the exposed surface defined by an edge is approximately 6 inches by 8 inches compared to the 3 feet by 10 feet of the sheet metal panels.

The change in scale of the roof covering elements will be most readable from the farm lane approaching the mill. Once the viewer is within 20 feet of the southwest elevation of the mill the site lines established by the topography and height of the building prevent the roof from being seen from the ground.

Texturally, the visual differences will be in the orientation of the roofing elements and the resultant shadow lines. Currently the existing metal roofing panels exhibit a verticality which is created by the ribs of the corrugation as well as the edges of the panels.

Wood shingles, due to their small size and the method of installation, give the roof more horizontally oriented shadow lines. Based on samples of existing historic shingles, the replacement wood shingles should be smooth sawn. This will give the appearance of a rough but uniform surface compared to that of
the even spacing of the ribs and the corduroy surfaces of the corrugated sheet metal.

A4. Preliminary Design Development

Preliminary design documents consists of the technical specification for smooth sawn white oak shingles; Section 07313 with amendment 07313-1, and detailed sketches. They have been included with this report as Appendix 6.

B. EXTERIOR FINISH TREATMENT OF THE SIDING

Existing Conditions: As part of the FY 87 preservation work, portions of the existing deteriorated siding (second generation) were removed and replaced with new material to improve the weather resistance of the building envelope. The new, third generation, replacement material was specified to be compatible with the existing historic siding in terms of specie, grade and moisture content, sawing process (sawn and resawn), cross sectional profile, and texture.

Regardless of this attempt to integrate the new siding with the existing siding, the difference in the visual characteristics between the old (second generation) siding and the new (third generation) siding become apparent when viewing the structure.

The combination of the two generations of horizontal clapboard siding which are currently on the building creates a duality in its appearance. This visual difference is created by the age and weathering of the siding. The siding which was in place in 1984 is Southern Yellow Pine (SYP) and had been on the structure long enough to mellow to a golden brown color. At some time in the past the siding was painted a "barn red" color. Most of this paint has completely weathered from the structure except in the most protected areas where exposure has been kept to a minimum.

The recently installed siding began to weather after being exposed to the elements. The raw quality of the fresh cut siding will begin to gray as it acclimates to the site. Over the next several seasons the new siding will continue with this graying process, but will never "catch-up" visually with the older siding. In the untreated state, the two generations of siding will always appear different.

The most obvious visual change will occur if the structure is stained or painted. A building which has sat unprotected for many years with exposed and weathering wood has a certain rustic quality which is lost when freshly painted. The fact that most of this structure was painted at some unknown date is indisputable as there is evidence of paint on most of the existing exterior components.
A determination of color based on the final paint analysis has been completed. This information is presented in the Paint Analysis Appendix.

Thus far, no documentary information exists as to when the building was painted, and no physical information has been discovered to date the existing paint. It can be assumed that since most of the paint film has weathered from the siding, the structure was last painted approximately 50 to 60 years ago. Without more defined information the specific year which the structure was painted will not be able to be precisely determined.

B1. Continued Exterior Preservation

Treat all exterior wood with the non-toxic water repellant mixture developed by the U. S. Forest Service, Forest Products Lab, Madison, Wisconsin. Apply treatment once every year for three to four years or until all wood has absorbed the water repellent to its maximum capacity, at which time liquid will bead on the surface. Treatment may then be reduced to once every three years.

B2. Treatment Alternatives

As to the treatment of the exposed wood, protection is obviously required. Several alternatives do exist, each with different maintenance and aesthetic consequences.

a. Treat all exterior wood with the non-toxic water repellant mixture developed by the U. S. Forest Service, Forest Products Lab, Madison, Wisconsin. Apply treatment once every year for three to four years or until all wood has absorbed the water repellent to its maximum capacity, at which time liquid will bead on the surface.

Treatment cycles may be reduced to once every three years if wood maintains water repellent qualities. This treatment has been used at the mill, with success, most recently towards the end of the FY 87 work program in August 1987. Non-toxic water repellant formula will be found in Phase II Preservation Work Plan, Appendix II.

NOTE: This treatment will darken the appearance of the wood and the contrast between the old and new siding will remain apparent although gradually diminishing over the seasons.

b. Stain all siding using a specified linseed oil based pigmented weathering stain to approximate the color of the older siding. Upon completion, all exterior wood will be treated as in Item I.
c. Conduct additional historical research to produce documentary data which can establish a time frame as to when the structure was painted. Additional physical research may be defined as trying to date an existing sample of paint. If dating were successful, it could then be determined whether the date established for the painting of the structure falls within the time frame being used to guide the preservation of the mill.

B3. Recommended Treatment

Treat all exterior wood with the Non-Toxic Water Repellent Solution during interim period prior to approval of Physical History and Analysis Section of HSR. Historical and documentary research carried out as other sections of this HSR are completed may disprove the current theory that the structure has always been painted.

At such time report is approved carry out staining of exterior of structure. Apply historic color matched linseed oil based opaque pigmented stain according to the following painting schedule.

Areas to be stained include: all siding boards at the SW, SE, and NW elevations; all exterior door, window, and corner trim; the box cornice, box eaves and rake boards; window sash and frames (including miller's office addition); all door frames;

DO NOT apply stain to the following areas. These areas will be treated with the non-toxic water repellent only. Areas to be left unstained include: the siding boards on the NE (rear) elevation; siding boards at the miller's office addition - all three sides; all exterior door surfaces. There is no physical evidence these items were ever treated with a surface pigment (paint or stain).

Miller's office addition will not be stained but will receive non-toxic water repellent treatment. However, the window sash and sash frames will be stained.

Statement of Effect: The above recommendation will continue to preserve the structure. The water repellent treatment which is recommended will continue to preserve and protect the exposed wood until it is stained. This treatment is recommended by U. S. Forest Service/Forest Labs as a primer coat for stain.

Future staining will unify the appearance of the structure. Use of opaque stain rather than paint will allow the texture and weathered qualities of the wood elements to remain visible through the stain.
B4. Preliminary Design Development

Preliminary design documents to follow based on approval of one of the proposed treatments or some other recommended alternative solution.

C. TREATMENT OF THE DOORS AND WINDOWS

Existing Conditions: As presented in Section IV. Individual Building Components; Doors, Windows, of this report, it is apparent the doors and windows have been subject to major alterations in order to accommodate various transitions in the operation of the mill.

The Phase II Preservation Work Plan identified work items for many of the door and window openings. Treatment of doors was limited. The plan indicates, "all doors are in relatively good condition and will require only minimal attention in terms of fabric replacement". Repairs were called out for D104 and D201. The completion report narrative indicates some work was done to the casing boards and thresholds. This work is documented in Phase II As-Built Drawings, found in the Project Record/Completion Report.

Window openings and the associated sash required different degrees of stabilization; the concept here was to preserve and reuse as much existing fabric as possible. Only two out of 13 windows had both upper and lower sash in place. Where sash remained, they were to be repaired, reglazed, and reinstalled. Where sash no longer existed, ventilating louvers were to be installed. An individual scope of work was called out for each of the 13 window units.

General notes concerning window preservation were also included. The Phase II Completion Report indicates all repair work was carried out. This work is documented in the drawings and schedules provided by the WPTC Project Leader Barry Caldwell. See "Schedule of Window, Timber and Epoxy Repairs".

C1. Continued Exterior Preservation

Periodic maintenance will be required.

C2. Treatment Alternative

The purpose of this discussion will be to present the various alternatives which exist concerning the doors and windows. The first alternative which must be considered is based on restoration of the exterior appearance of the mill to an earlier date. (Pre 1900, before change over to turbine system).

a. Restore exterior openings to configuration presented in elevation sketches in Physical Evidence. These locations can
be justified based on indications in the framing of the stud walls.

Evidence of the earlier location of windows and certain doors was presented in the Physical Evidence section. Since the chronology of alterations to the mill is not date specific, nor can it be at this point in the research; and the goal of the preservation project is retention of extant fabric, this treatment cannot be given serious consideration.

b. Continue to preserve exterior openings as they currently exist. This would represent no additional work being executed with the exception of periodic surface treatment of the individual components. This includes preventative maintenance and replacement of broken glass.

c. Complete the reconstruction of the missing four light double hung wooden sash units. Reconstructed units would include the following window units: unit number W100 - in conjunction with reconstruction of the wood frame addition, W103, W104, W105, W201, W203, W204, and W302. This does not include reconstruction of missing sash where the opening has been modified to remove an upper or lower sash and siding has been installed, or where a "permanent" shutter has been installed.

Examples where later alterations would remain intact include unit W101, lower sash replaced by siding, W102, upper and lower sash replaced with exterior shutter; and W103, upper sash has been replace by siding. No historic sash units exist in these areas, and the siding is to be preserved within the framed openings.

Re-evaluate condition of historic doors and hardware, determine additional work to preserve and secure doors and frames.

d. Concerning the existing shuttered openings, shutters will be preserved and/or repaired intact. Louvers or glazed sash will be constructed to sit within the framed opening on the interior side of the existing shutters. These will be flashed to make the glazed opening resistant to water infiltration.

C3. Recommended Treatment

Development of a window and door schedule to guide the implementation of Recommendations C2c and C2d.

Statement of Effect: No appreciable effect. Currently existing half window louvers would be replaced with glazed sash. Shuttered openings will remain intact with a more weather resistant treatment behind the shutter. Doors will be unaffected as the only
proposed work would be to replace the worn drivebelt strap hinges at D102. Other preservation and/or repair work would be detailed in a door schedule. All exterior wood would be surface treated with the USFS non-toxic water repellent treatment.

C4. Preliminary Design Development

Preliminary design documents, including window and door schedules, to follow. Schedules based on approval of one of the proposed alternative treatments or some other recommended alternative solution. Specifications for application of exterior stain with material selection need to be developed.

Work to date is shown in Phase II Completion Report. See section, "Schedules of Window, Timber and Epoxy Repairs".

D. MISSING OR INCOMPLETE ARCHITECTURAL FEATURES

I. NORTHWEST ENTRANCE PORCH & WEATHER HOOD @ D201
II. WOOD FRAME ADDITION, MILLER'S OFFICE

Existing conditions: As stated in the Physical Evidence section, there is little conclusive evidence concerning the development of either, I. Northwest Entrance Porch & Weather Hood @ D201 or, II. Wood Frame Addition, Miller's Office. In terms of the evolution of the existing structure, the exact relationship of these elements to the main timeline of the structure has not yet been determined.

The wood frame addition was stabilized as part of the FY87 work, and is in relatively sound condition. No work was completed at the remains of the weather hood at D201, and they are in very poor condition. There are no extant fabric remains of the entrance porch.

I. NORTHWEST ENTRANCE PORCH & WEATHER HOOD @ D210

D1. Continued Exterior Preservation

Considering what is known about this feature it is pure speculation to reconstruct any type of porch or loading dock structure at this point. Although oral histories indicate that some type of receiving or unloading structure stood at this place, there is no physical evidence to support any type of reconstruction. It is also apparent that the existing grade at the elevation has dropped over the years due to continued use and erosion.

To maintain the remaining historic fabric some stabilization is required. Support existing fabric in place, treat with USFS non-toxic water repellent.
D2. Treatment Alternative

a. Continue to maintain and preserve the limited physical evidence of this architectural feature.

b. Continue to search for historical data which may present further evidence of its function and appearance.

c. Conduct an archeological investigation of this area in the vicinity of the Northwest Elevation. The exercise would determine if there are any structural remains of a foundation or post holes for some type of structure once constructed in this area.

d. Reconstruct structure base on limited current knowledge.

e. Remove remaining evidence from structure and interpret.

D3. Recommended Treatment

Reconstruction of this feature cannot be recommended as there is no conclusive evidence of its appearance or function. The current recommendation is to proceed with the above recommended alternative treatments a, b, and c.

Statement of effect: No appreciable effect on existing structure.

D4. Preliminary Design Development

Preliminary design documents including drawings and specifications as needed and provided based on approval of a proposed treatment or some other recommended treatment.

II. WOOD FRAME ADDITION. MILLER'S OFFICE

Existing conditions: The initial proposal in the Phase 2 Preservation Work Plan called for the retention of this feature.

To preserve this addition it will be necessary to reconstruct portions of the frame walls, floor and roof framing system. It will require 70 percent new exterior siding, 98 percent new roof sheathing and 100 percent new roof shingles.

This was later amended to conduct a limited structural stabilization of the existing structural skeleton until more was known about the details of the construction of the wood frame addition. The structural stabilization work was completed during the Phase II Project. This addition has now been recorded by the HAER program as well as the Southwest Region and sufficient
information is known to proceed with the initial proposal put forth in the Phase 2 Preservation Work Plan.

D1. Continued Exterior Preservation

Continued exterior preservation of extant structure will include periodic maintenance and possible additional external bracing as historic structure continues to deteriorate.

D2. Treatment Alternatives

a. Continue with the preservation of this frame addition as it currently exists until all research for this HSR has been conducted and is completed. This includes continued treatment of the structure with the USFS Non Toxic Water Repellant as well as continued monitoring for further structural deterioration.

This treatment will have a limited lifespan; the currently existing structural remains of the frame addition are severely deteriorated. Even with the structural support system currently in place the extant components will continue to deteriorate and will eventually fall away, or have to be removed.

b. Conduct thorough documentation of structure using photographs, written descriptions, and any other detailed drawings necessary to record the construction of the addition. Dismantle the addition and secure D104. Do not reconstruct addition. Provide site interpretation of previously existing addition to visitors.

c. Proceed with reconstruction of the frame addition using all available physical and historical data. The exact appearance of this feature will be determined during the design review. It should be noted that there is some photographic evidence as to the appearance of the Southeast elevation. There is sufficient remaining physical evidence of other sections of this addition to proceed without any conjecture as to its construction.

D3. Recommended Treatment

Continue preservation of extant structural remains during interim period until HSR is completed. Once this is approved, then proceed with the reconstruction of the addition as per Alternative D2c and Phase 2 Preservation Work Plan. These plans call for integration of historic fabric, as possible.

Statement of effect: Reconstruction of the miller's office will add to the interpretive value of the mill as it relates to technological development. Visually the small 12' X 6'
structure is not on a principal elevation and can only be seen by those looking at the SE elevation. In terms of the preservation value of the addition, it does relate to the period of significant operation and should be reconstructed.

D4. Preliminary Design Development

Preliminary Design Documents including drawings and specifications as needed and will be provided based on the approval of one of the proposed treatments or some other recommended alternative treatment.
VII. COST ESTIMATES for ALTERNATIVE & RECOMMENDED TREATMENTS

All cost estimate information is of the Class B level. This includes estimated costs of material and primary labor costs. It DOES NOT include costs for project mobilization or overhead expenses. This estimate assumes NPS day labor work forces and supervision.

Refer to Preliminary Design Recommendations for Continued Exterior Preservation for additional information concerning recommendations. Estimate is provided for those items identified in the "Treatment Alternatives" sections. Design recommendations are thus indicated.

A. RESTORATION OF THE ROOF

For estimating purposes say 20 squares which includes labor and 20% waste material

a. Preserve existing metal roof/install secondary roof system

$ 400/ square x 20

$ 8000

b. Replace metal w/ metal

$ 150/ square x 20

$ 3000

c. Recommendation: Replace existing metal w/ white oak smooth sawn shingles to match existing historic shingles. Specification provided. See Appendix 6.

$ 600/ square x 20

$ 12,000

B. EXTERIOR FINISH TREATMENT

For estimating areas say 28 squares, area for openings has been deducted.

a. Treat w/ non-toxic water repellant ONLY

$35/ square x 28

$ 980

b. Recommendation: Stain new siding and prime w/ non-toxic system

$ 60/ square x 28

$ 1680
c. Conduct additional research

No estimate.

B4. Design development for recommendations $ 4000

C. TREATMENT OF DOORS AND WINDOWS

a. Reconstruct early period openings.

For estimating purposes say 18 openings require this
degree of work

$ 450 per opening x 18 $ 8100

b. Preserve existing conditions with annual routine
maintenance.

$ 300 per annum, complete $ 300 PA

c/d. Recommendation: Complete replacement of missing sash
begun in Phase 2. For estimating purposes say 12
openings require further work. (Based on FY87 Completion
Report). Re-evaluate doors and hardware and shutters.

$ 450 per opening x 12 $ 5400

D. MISSING OR INCOMPLETE ARCHITECTURAL FEATURES

I. NORTHWEST ENTRANCE PORCH & WEATHER HOOD @ D201

a. Continue maintenance, per annum $ 100 PA

b. Continue research No estimate

c. Conduct archeological research No estimate

Recommendation: a, b, and c No estimate

d. Reconstruct feature $ 5000

e. Remove existing from site $ 300
II. WOOD FRAME ADDITION * (Millers Office)

a. Continue preservation of existing with annual routine maintenance, no further work, per annum. $ 250 PA

b. Document and dismantle existing structural remains, complete. * $ 1000

c. Proceed with reconstruction, includes labor & materials, complete. $ 4000

Recommendation

Proceed with reconstruction of the addition as per Alternative "c" and Phase 2 Preservation Work Plan. complete. * $ 4000

* Assumes NPS day labor work force
VIII. SUGGESTIONS for FUTURE RESEARCH

1. Continued research of mill equipment and turbine with Charles Howell to date period of major changes and upgrading of the facility.

Recommended sources:

Charles Howell
42 B, Kenwood Drive, Squire Village
New Windsor, New York 12550  (914-562-5592

or

Manitou Machine Works, Inc.
37 Main Street
Cold Spring, New York 10516  (914-265-3153)

2. Correlation of milling equipment changes and building changes.

3. Conduct a more comprehensive study of the milling and power systems leading to a more detailed report and flow system analysis of the various milling processes.

4. Recommendations for conservation of the existing milling equipment and the power systems, to be included with above analysis.

5. Continue research to determine exact patent dates of turbine and its' commercial availability in Newton County.

6. Conduct research into weather data to determine when the Buffalo River has actually flooded in the Boxley Valley during period of concern, 1840 through present.

6a. Contact Department of Water Resources, USGS, Little Rock, Arkansas.

6b. Contact Resource Management Branch Records, Division of Natural Resources, Buffalo National River, NPS, Harrison, Arkansas; contact Steve Chaney, Russ Lesko or Pam Griffin.

7. Establish fluctuations in Mill pond levels, based on precipitation records to determine periods of mill operation and limited or inactivity.

8. US Census Data for the Boxley Valley.

9. Further Research to establish the date of concrete flume construction and wash out.
10. Establish Nail chronologies using fasteners from site.

11. Contact Kenneth L. Smith and conduct personal interview concerning his previous dealings with the mill and resources available, to be taped and scripted by an historian.

12. Complete more comprehensive scientific analysis of paint.

13. Incorporate archeological landscape and historical research date with additional fabric research.

Thoughts Regarding Historical Research Needs

A few suggestions compiled by Suzie Rogers, Historian, Buffalo National River, 1988

1. Oral history, both from those who know something about the operation of the mill and from the perspective of those who remember it as a community service. This is probably the most essential item, as this age group is growing older rapidly.

2. Search for historical photographs.

3. Perusal of county records, ie. tax, census records, etc.

4. Documentation of the larger site area, including a history of the use of the mill pond for recreation fishing, thus the standing cabins.


6. Pursue the unresolved question of the first mill (pre - 1870), its location and its part in the Civil War skirmish named after it.
IX. BIBLIOGRAPHY


Barry T. Caldwell. PHASE II Boxley Mill Stabilization, Completion Report and Project Record, Division of Conservation, Southwest Cultural Resources Center, National Park Service, Santa Fe, New Mexico, 1987.


Douglas C. Hicks. PHASE I Boxley Mill Stabilization, Completion Report and Project Record, Division of Conservation, Southwest Cultural Resources Center, National Park Service, Santa Fe, New Mexico, 1986.


Steele T. Kennedy. "I Visit Old Boxley - Pioneer Community in the Boston Range (Just Rambling Around the Ozarks)", Ozarks Mountaineer, Arkansas.


*Upper Big Buffalo Area, Boxley Valley, Oral History Project, Phase II.* Center for Ozarks Studies, Southwest Missouri State University, Springfield, Missouri. Interview of Nellie Villines by Flanders, Morrow, and Liles, June 7, 1984, transcribed by Melanie Leaver.

------. Interview with Nellie Villines, Boxley, Arkansas. 05/86

APPENDIX 1.

EMERGENCY STABILIZATION BIBLIOGRAPHY

September 1984

Primary Documents

1. Report Classified Structure Field Inventory Report Buffalo National River, Park #7150; Boxley Mill, Structure #11A, Boxley Valley
PREPARED: Laura E. Soulliere, Survey Historian, Division of History, Southwest Regional Office, National Park Service, Santa Fe, New Mexico, November 1983.

Old Boxley Water Mill Report;
TO: Assistant Manager, DSC, SE/SW Team;
FROM: Historical Architect C. Craig Frazier

TO: Associate Regional Director for Planning and Cultural Resources, Southwest Region (SWR)
THROUGH: Chief, Division of History, SWR FROM: Survey Historian, Laura Soulliere, SWR

4. Memorandum 8/29/84: Boxley Mill. Mills state of disrepair, emergency stabilization work urgently needed, have owners permission to make repairs, we intend to take those few measures, stabilization strategy, documentation of structure, advance planning prerequisite, XXX for emergency work)
TO: Regional Director, SWR
FROM: Superintendent, Buffalo National River

5. "XXX" Boxley Mill Emergency Work
Emergency preventative action to forestall further damage, remove tree threatening historic structure, brace structure, etc.
PREPARED: Asst. Supt., BUFF, 8/29/84
APPROVED: Regional Director, SWR, 10/3/84

6. Field Notes Basic Building Inspection Notes
Thomas A. Vitanza, Williamsport Preservation Training Center, Denver Service Center, 9/14/84.
7. Memorandum 10/12/84: Project Compliance Approval Emergency Work, Stabilizing Boxley Mill
TO: Superintendent, BUFF
FROM: Chief, Southwest Cultural Resources Center, (SWCRC), SWR

8. Memorandum 10/29/84 Emergency Stabilization of Boxley Mill
TO: Superintendent, BUFF
FROM: Chief, Division of Conservation (PCC), SWR

Recommendations for HABS/HAER Documentation, ie:
Boxley Mill merits complete technological and architectural documentation; additional stabilization is needed to ensure safety of recording team.
TO: Associate Regional Director, PCR, SWR
THROUGH: Chief, SWCRC
FROM: Historical Architect MB Thurber, PCC, SWR
NOTE: Reference 03/20/85 Trip Report by TA Vitanza for same trip; stabilization priorities.

10. Memorandum 05/13/85: Request for Approval of Historic Preservation Maintenance,
TO: Regional Director, SWR
ATTN: Chief, PCC
FROM: Acting Superintendent, BUFF

11. "XXX" Preservation Maintenance, Boxley Structures
PREPARED: BUFF, 06/12/85
APPROVED: Regional Director, SWRO, 06/24/85

12. Memorandum 08/23/85: Boxley Mill Artifacts
Concerns over security and well-being of numerous items and equipment now that the mill is public property; ref. Museum Collections standards.
TO: Regional Director, SWR;
ATTN: Regional Curator, SWR
FROM: Acting Superintendent, BUFF
Programming Documents

10-238 PKG 140; revision 140-1, Stabilize Boxley Mill
TYPE:
ORIGINATOR: Asst. Supt., BUFF, 07/11/84
APPROVAL: Regional Director, SWR, 10/05/84

10-238 PKG B47; Stabilize Boxley Mill, (Emergency Work)
TYPE: Cultural Cyclic
ORIGINATOR: Asst. Supt., BUFF, 07/12/85
APPROVAL: Regional Director, SWR, 09/06/85

10-238 PKG 221, Documentation by Historic American Engineering Record (HAER)
TYPE:
ORIGINATOR: Asst. Supt., BUFF, 07/10/85
APPROVAL: Regional Director, SWR, 08/12/85

10-238 PKG 170, Historic Resources Study
TYPE:
ORIGINATOR: Chief Park Interpreter, BUFF, 10/14/83
APPROVAL: Regional Director, SWR, 04/16/84

Applicable Reports

US DEPARTMENT OF INTERIOR, NATIONAL PARK SERVICE

Final Master Plan, Buffalo National River,
Approved October 16, 1975

Statement of Management,
Approved February 2, 1977

Development Concept Plan, Steel Creek - Lost Valley,
Approved October 3, 1983

Boxley Valley Land Use/Cultural Landscape Management Plan,
Approved April 16, 1985

Resources Management Plan, Cultural Resources Management,
Updated January 5, 1987
APPENDIX 2.

PHASE I STABILIZATION/PRESERVATION BIBLIOGRAPHY

Summer 1986

Primary Documents


STRUCTURAL SCOPE OF WORK: Outlined in Structural Engineer Robert Welton's Trip Report of 05/06/86. Includes engineer's calculations and material specifications for external structural pipe support system.

DRAWINGS: Structural Stabilization of Boxley Mill, Drawing Set Number 173/41063, 2 sheets, PKG B-47, dated 04/86, designed by Robert Welton, Structural Engineer. Sheet 2 features "Sequence of Stabilization", 37 steps and structural details for Phase I preservation work.


Related Documents

1. Script: 09/03/85: Oral History Interview (Portion), Containing Information on Boxley Mill INTERVIEW of Mr. Dewey Clark CONDUCTED BY: James E. Liles, Asst. Supt., BUFF

2. Memorandum: 03/14/86, Structural Engineering Assistance Request for assistance for structural work TO: Manager, Denver Service Center; ATTN: Mgr., Central Team FROM: Regional Director (Acting), SWR

3. Letter: 03/16/86, Thoughts concerning proposed project to document the Villine's (Boxley) Grist Mill in the Boxley Grist Mill in the Boxley Valley TO: Mr. Alec Gould, Superintendent, BUFF FROM: Mr. Eric N. DeLony, Principal Architect, HAER
4. Memorandum: 03/21/86, Project Compliance, Cultural Resource Preservation
Submittal of XXX's for Boxley Mill and Whiteley School; request for assistance at Whiteley School by SWR Preservation Crew and technical engineering assistance to investigate foundations.
TO: Regional Director, SWR
FROM: Superintendent, BUFF

5. Memorandum: 03/21/86, Scheduling and Logistics for HAER team project at the mill
TO: Eric DeLoney, Principal Architect, HAER
FROM: Alec Gould, Superintendent, BUFF

6. Letter: 03/26/86, Planning for HAER project in summer, thanks to Eric for getting out to the park, discussion of logistics and post project exhibit
TO: Mr. Eric DeLony, Principal Architect, HAER
FROM: Superintendent, Alec Gould, BUFF

7. Memorandum: 04/07/86: Status of Compliance Review for Boxley Mill and Whiteley School
Concerning the recent submission of two XXX's and status of FY 86 301 funding allotment, Southwest Region preservation crew workload.
TO: Superintendent, BUFF
FROM: Chief, PCC, SWR

8. Memorandum: 04/08/86, Trip Report, 03/31 - 04.02/86 Boxley Mill Stabilization
To meet with DSC Structural Engineer Welton (TCE) and to finalize logistics with Mr. Liles.
TO: ARD, PCR, SWR
FROM: Supervisory Exhibits Specialist, PCC, SWR

9. Letter: 04/22/86, Transmittal of MOA to SHPO, comments on SHPO working exhibit of HAER drawings of mill into the "... grand scheme of the (Arkansas) Sesquicentennial".
TO: Mr. Wilson Stiles, Arkansas Historic Preservation Program, (SHPO)
FROM: Alec Gould, Superintendent, BUFF

10. "XXX": Preservation Maintenance, Boxley Valley Structures
To stabilize National Register Property and render it safe for documentation for HAER crew, June 1986.
PREPARED: BUFF, 07/21/86 (signed after approval ?)
APPROVED: Regional Director, SWR, 04/24/86
11. Memorandum: 05/01/86, Preservation Work at Boxley Mill, PKG B-47 Transmittal of final, approved Scope of Work for Phase I preservation work at the mill.
TO: Superintendent, BUFF
FROM: Regional Director, SWR

12. Memorandum: 05/06/86, Preservation Work at Boxley Mill, PKG B-47, Structural Engineer Trip Report, Trip of 04/1-2/86, Outlines Structural Scope of Work for 1986 work; includes engineers calculations and material specifications for external structural pipe support system.
TO: Asst. Mgr, DSC-TCE;
FROM: Structural Engineer, Robert Welton, Engineering Section, DSC-TCE

13. Memorandum: 05/09/86, Boxley Grist Mill Team logistics
TO: Superintendent, Assistant Superintendent, BUFF
FROM: Chief Interpreter, BUFF

14. Memorandum: 05/15/86, Summer HABS/HAER Projects in Southwest Region; transmittal of approved Memoranda of Agreement including Buffalo National River's.
TO: Associate Director, Cultural Resources, WASO
FROM: Regional Director, SWR

15. Memorandum: 05/23/86, Orientation Meeting, HAER project, BUFF
To integrate crew schedules, discuss impacts of preservation work on structure, safety issues.
TO: Chief, HABS/HAER Division
FROM: Acting Regional Director, SWR

16. Report: A Brief and Informal History of the Boxley Mill, Also Known as the Whiteley Mill
Recorded by Suzie Rogers, 07/08/86
Includes Bibliography believed to be fairly accurate by the author.

17. Letter: 07/15/86, Photographs of Boxley Mill taken by Kenneth L. Smith in 1959 sent to Doug Hicks for copying and use in summer of 1986 work.
TO: Douglas C. Hicks, Exhibits Specialist, PCC, SWR
FROM: Kenneth L. Smith, Fayetteville, Arkansas

18. Memorandum: 07/16/86, Official Name for "Boxley Mill" Logical analysis of why mill should be known as the Boxley Mill rather than any other various currently used nomenclature.
TO: Superintendent, BUFF
FROM: Historian Suzie Rogers, BUFF
TO: Chief, Division of Conservation, SWR
FROM: Supervisory Exhibit Specialist, PCC, SWR

20. Memo: 07/23/87, Review and Approval of Structural Stabilization Drawing No. 173/41063, Boxley Mill allow only for completion of Items 1 through 16 as identified in the sequence of stabilization.
TO: Manager, DSC
ATTN: Asst. Mgr., Central Team, DSC
FROM: Acting Regional Director, SWR

21. Memo: 08/26/86, Boxley Mill Drawings Drawings are outstanding, transmittal of scripts from audio tapes and text from History of Newton County book.
TO: Principal Architect, HAER, WASO, Eric DeLoney
FROM: Asst. Supt. BUFF, James E. Liles

22. Memo: 12/15/86, Transmittal of Boxley Mill Grist Mill Reports
TO: Superintendent, BUFF
FROM: Chief, Division of Conservation, SWR

Programming Documents

10-238: PKG B-47, Stabilize Boxley Mill, Cultural Cyclic Maintenance
ORIGINATOR: Asst. Supt., BUFF, on 07/11/84
APPROVAL: Regional Director, SWR on 10/05/84.

10-238: PKG 221, Record Historic Structure by Haer Survey. 301 Cultural Cyclic
ORIGINATOR: Asst. Supt., BUFF on 06/26/85
APPROVAL: Regional Director, SWR on 08/12/85.

10-238: PKG 140, Stabilize Boxley Mill
ORIGINATOR: Asst. Supt., BUFF, 07/11/84]
APPROVAL: Regional Director, SWR, 09/06/85.

10-238: PKG 140-1, Stabilize Boxley Mill 302, Cultural Resource Program
ORIGINATOR: Asst. Supt., BUFF on 07/12/85
APPROVAL: Regional Director, SWR on 09/06/85.

10-238: PKG 170; Calls for Historic Resource Studies.
Applicable Reports

DEVELOPMENT CONCEPT PLAN (DCP), STEEL CREEK - LOST VALLEY; Approved (10/03/83)

GENERAL MANAGEMENT PLAN; Approved 10/16/75.


RESOURCE MANAGEMENT PLAN

Bibliographic References


APPENDIX 3.

PHASE II: STABILIZATION/PRESERVATION BIBLIOGRAPHY

Summer 1987

Primary Documents

PHASE 2 PRESERVATION WORK PLAN with Appendices, by Supervisory Exhibit Specialist Douglas C. Hicks and Historical Architect Thomas A. Vitanza, Southwest Cultural Resources Center, Division of Conservation, Southwest Region, National Park Service, 03/17/87.

APPENDICES TO PHASE II PRESERVATION WORK PLAN:

I. Scope of Work for Structural Engineer (DSC-TCE)
II. Non-Toxic Water Repellant
III. Plans for Ventilating Louvers including attached dwgs.
IV. Report of Structural Engineer's Investigation and Design Recommendations (Interim Report, April 87)
V. Stabilize Boxley Grist Mill, Phase 2, SWR Drawing Set numbered 173/ 80022, Sheets 1 - 22, dated 03/87, Annotated HAER Drawings, AR-3
VI. Structural Stabilization Drawings, DSC Drawing Set numbered 173/ 41063, 2 sheets, dated 04/86
VII. Preservation of Wood Frame Addition, Addendum Drawing Number 1, SWR Drawing Set no. 173/ 80022, one sheet, dated 03/87.

BOXLEY GRIST MILL, COMPLETION REPORT, Package B-47, Division of Conservation.


STRUCTURAL STABILIZATION, BOXLEY MILL by Robert Welton, Structural Engineer, DSC, Central Team, April, 1986,. Southwest Region drawing set number 173/ 41063, 2 sheets structural drawings and sequence of work.

Related Documents

   TO: Associate Regional Director, PCR, SWR
   THROUGH: Chief, SWCRC and Chief, PCC
   FROM: Historical Architect Vitanza and Supervisory Exhibits Specialist Hicks, PCC, SWR

   TO: Regional Director, SWR
   ATTN: Chief, Planning and Design
   FROM: Superintendent, BUFF

   TO: Associate Director, Cultural Resources, WASO
   ATTN: Chief, HABS/HAER Division, Principal Architect
   FROM: Associate Regional Director, PCR, SWR

   TO: Superintendent, Buffalo NR
   FROM: Regional Director, SWR

5. "XXX" Stabilize National Register Property, Boxley Mill
   Request to implement Phase 2 Preservation Work Plan
   Park Project #H87-15, Preservation Maintenance
   PREPARED: Asst. Supt., BUFF, 03/16/87
   APPROVED: Regional Director, SWR, 03/25/87

6. Memorandum: 04/01/87: Project Compliance Approval
   Approval by Regional Director, SWR of Phase 2 work at Boxley Mill
   TO: Superintendent, BUFF
   FROM: Chief, SWCRC, SWR

7. Memorandum: 05/01/87: Transmittal of Boxley Grist Mill
   Structural Stabilization Phase II, Interim Report
   TO: Regional Director, SWR
   FROM: Assistant Manager, DSC, TCE

8. Memorandum: 05/18/87: Boxley Grist Mill Structural
   Stabilization Phase II - Interim Report; acceptance by SWR.
   TO: Manager, DSC; ATTN: Assistant Manager, TCE
   FROM: Regional Director, SWR

67
   TO: Superintendent, BUFF
   FROM: Chief, Division of Conservation, SWR

    TO: Superintendent, BUFF
    THROUGH: Chief, SWCRC & Chief, Division of Conservation
    FROM: Exhibit Specialist/Restoration, Williamsport Preservation Training Center, DSC, TEA

11. Memorandum: 07/21/87: Boxley Mill Stabilization, Phase II Commendations on completion of Phase II, concerns over programming to assure desired roof work in FY88,
    TO: Chief, SWCRC, SWR
    FROM: Superintendent, BUFF

12. Memorandum: 01/05/87: Cultural Resources Management Plan, Transmittal of updated plan.
    TO: Regional Director, SWR
    ATTN: Chief, SWCRC
    FROM: Superintendent, BUFF

Programming Documents

NEED LIST FROM PCC, SWR of applicable documents for FY87.

Applicable Reports


Report: A Brief and Informal History of Boxley Mill, Also Known as the Whiteley Mill
Recorded by Suzie Rogers, 07/08/86; updated by the author 04/88. Includes annotated bibliography.

Memorandum: 04/25/88: Historical Information on Boxley Mill
To: Boxley Mill HSR Team, Williamsport Preservation Training Center, HFC
FROM: Historian, BUFF
APPENDIX 4.

NATIONAL REGISTER NOMINATION FORM

and BIBLIOGRAPHY
Form 10-300 UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
(Rev. 6-72)
NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY - NOMINATION FORM

1. NAME

COMMON: OLD BOXLEY WATER MILL
AND/OR HISTORIC: Whiteley Mill

2. LOCATION

STREET AND NUMBER: 1 mile north of Boxley on Arkansas 43
CITY OR TOWN: Boxley
STATE: Arkansas
COUNTY: Newton

3. CLASSIFICATION

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PRESENT USE (Check One or More as Appropriate)

- Agricultural
- Commercial
- Educational
- Entertainment
- Government
- Industrial
- Military
- Private Residence
- Religious
- Museum
- Scientific
- Transportation
- Comments
- Other (Specify) Unused

4. OWNER OF PROPERTY

OWNER'S NAME: Clyde Villines
STREET AND NUMBER: Rural Route
CITY OR TOWN: Boxley
STATE: Arkansas

5. LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC:
Newton County Courthouse
STREET AND NUMBER: Square
CITY OR TOWN: Jasper
STATE: Arkansas

6. REPRESENTATION IN EXISTING SURVEYS

TITLE OF SURVEY: Arkansas Historic Preservation Program
DATE OF SURVEY: September 1972

DEPOSITORY FOR SURVEY RECORDS:
Arkansas History Commission
STREET AND NUMBER: 300 West Markham
CITY OR TOWN: Little Rock
STATE: Arkansas
The original mill (c. 1840-1870) is a site only. The only documented description states that it was small and crude.

The later mill (c. 1870-present) was constructed on the site of the original. The mill, race, spring, and mill pond remain virtually unchanged by modernization.

The mill building is a large three-storey frame and clapboard structure resting on a foundation of unmortered, stacked native stone. The framing consists of huge hand-hewn oak timbers, the center beams measuring 10" x 12" x 40' and the cross beams 6" x 8" x 30'. The rafters are cedar poles of 4-5" diameter. The original shake roof has been replaced with tin.

The mill has deteriorated due to disuse and a faulty roof. Much of the clapboard siding is in a state of rapid decomposition and some boards are missing. Floor planks are weak and unsafe. However, the oak beams and cedar rafters are in an excellent state of preservation and the structure remains fairly level.

The building contained a grist mill, flour mill, cotton gin, saw mill, and later a hammer mill. The grist mill on the ground floor, the flour mill with its belts, bins, pulleys and chutes on the second and third floors, and fragments of the cotton gin remain.

The mill was powered by a turbine of which the gears and shafts remain extended from the side of the building at the end of the race. A large permanent spring feeds the mill pond from which a rocked in race supplies water to the mill. The spring, pond, and race remain unchanged except for a section of the race which was modernized by the addition of concrete sides before the mill ceased operation.
The Boxley (Whiteley) Mill is an excellent example of a once common local industry which was vital to the settlement and economic development of many early rural Arkansas communities. Not only are the building, pond, and race present but more important the various equipment necessary for the operation of a flour and grist mill remains largely intact.

The original mill, built by Abner Casey (c. 1840), supplied services to the settlers of the upper Buffalo River valley. At an unknown later date Samuel Whiteley purchased the business which then became known as "The Whiteley Mill".

This small mill was razed (1870) due to its inadequacy in fulfilling the increased demands of a growing populace. The community then employed a man named Miller to construct a larger more efficient mill at the same location.

Robert Villines became the new Miller. His son, James Larkin Villines, and grandson, Clyde Villines, each in their turn became the owners and millers.

A general lack of business forced Clyde Villines to cease the mill's operation in the 1960's ending, a long history of community service.

The mill was also the site of a two hour skirmish, described by the following Civil War dispatch:

"The battle of Whiteley's Mill (Boxley) was fought April 5, 1864. The Union officers were: Captain Orr of Co. C and Lieutenant Bell of Co. L. The guerilla leaders were Cecil, Cooper and Patton. Pvt. John H. Murray of Co. F was killed and Obed W. Patty of Co. I missing. Pvt. Gustavus Bishop of Co. C was wounded. The man missing had his horse shot dead under him, and is probably a prisoner, if not killed. The loss of the enemy has not been ascertained."
8. **Significance Continued:**

The mill, pond, and skirmish site are within an area which has been proposed for acquisition by the National Park Service for the Buffalo National River.

The mill may be restored as a feature of the National River.
9. MAJOR BIBLIOGRAPHICAL REFERENCES


10. GEOGRAPHICAL DATA

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APPROXIMATE ACREAGE OF NOMINATED PROPERTY: 14.5 acres

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES:

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11. FORM PREPARED BY

NAME AND TITLE: Edward P. Baxter, Field Historian
ORGANIZATION: Arkansas Historic Preservation Program
STREET AND NUMBER: 1023 West Third
CITY OR TOWN: Little Rock

12. STATE LIAISON OFFICER CERTIFICATION

As the designated State Liaison Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service. The recommended level of significance of this nomination is:

National □ State □ Local □

NAME: William E. Henderson
TITLE: Preservation Officer
DATE: October 10, 1973
9. Major Bibliographical References Continued:


The Newton County Homestead, No. 1, April 1959. Publication of the Newton County (Arkansas) Historical Society, p. 25.


National Register Bibliography


Francis Graves. The Whiteleys of Northwest Arkansas, Family History File, Arkansas History Commission. (Typewritten)


The Newton County Homestead, No. 1 April, 1959. Publication of the Newton County (Arkansas) Historical Society, P. 25.

The Newton County Homestead, Vol 1, No. 1, April, 1961. Ibid., p. 55.

APPENDIX 5.

PAINT ANALYSIS DATA
Paint Analysis Data

Paint analysis was conducted on samples removed from the structure. The structure was inspected to determine the most likely places to remove representative samples. Areas were chosen where the weathering of the painted surface was best preserved. Two samples were selected for analysis. Elevations of the structure included in the Physical History/ Evidence section of this report have notations indicating test sample locations.

Two representative samples were tested by members of the North Atlantic Historic Preservation Center lab and the Williamsport Preservation Training Center. Microscopic and microchemical analysis was conducted using the methods perfected at the North Atlantic Historic Preservation Center, Charlestown, Massachusetts. The purpose of these tests is to determine the number and original composition of the historic surface coatings. The analysis seeks to determine the number of layers of coatings, types of coatings, physical characteristics of layers, original color of coatings, and approximate date or period of each layer, if possible. The results of those test are included here.

Both samples were identical in terms of analysis. Only one layer of paint was found. It was not possible to determine the exact composition of the paint or of its age. General conclusions are that the paint samples were deteriorated due to exposure and were between 30 and 40 years old. Also, it appears that an exterior oil based paint or stain was used.

Color matching of the samples to the Munsell Color Standard Index was completed. In both cases the same notation was selected. The Munsell Color Standard notation is 7.5R/ 4/8. One 5" by 7" matte color standard sample card from Munsell is attached with each copy of this report.

Original sample cards and the test specimens will be turned over to Buffalo National River as part of this document package.

Munsell Color
2441 North Calvert Street
Baltimore, MD 21218, USA
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<td>Hours Under UV</td>
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P001 Reverse: Brick red
Brick red; 1 finish, 7.5R 4/8

Paint Analysis Card No. P001, Boxley Grist Mill, Buffalo NR
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**Analysis**

- Substrate: Wood
- No. of Layers: One
- Hours Under UV: Unknown
- Date Matched: May 1988
- Layer Matched: #1 Finish
- Color Matched: Brick Red
- Munsell Notation: 7.5R 4/8

**Recommendation**

**Slide Number**

---

**P002 Reverse:** Residue of white?
Brick red
Brick red; 7.5R 4/8

**Paint Analysis Card No. P002, Boxley Grist Mill, Buffalo NR**
Bill To:  
5773 USDI NATIONAL PARK SERVICE (WVA)
HARPERS FERRY FINANCE CENTER
ATTN: FINANCE OFFICE
HARPERS FERRY, WEST VIRGINIA
25425

Ship To:  
USDI-NAT'L PARK SERVICE-WPTC
ATTN: TOM VITANZA
205 W. POTOMAC STREET
WILLIAMSPORT, MD 21795

Payment Terms: NET 30 DAYS

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IMPORTANT/EXPORT LICENSE
NOT REQUIRED UNLESS STATED.

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APPENDIX 6.

Wood Shingle Specification and Details

Section 07313
SECTION 07313  WOOD SHINGLE ROOFING

PART 1: GENERAL

1-1 DESCRIPTION: The work of this section consists of furnishing the white oak wood shingles to reroof the historic Boxley Mill building at Buffalo National River, Arkansas. Installation of these shingles will be by a National Park Service Preservation Team operating under the auspices of the Division of Conservation of the Southwest Regional Office.

1-2 QUALITY ASSURANCE: No applicable grading standards exist for white oak shingles. Compliance with product specification shall serve as quality assurance.

1-3 SUBMITTALS: Submit random samples of specified shingle, in advance, for approval by the National Park Service Project Architect/ Exhibits Specialist - Restoration/ Project Supervisor.

1-4 GUARANTEE: Product shall carry a 20 year warranty to the original buyer against any defects in manufacturing workmanship and quality of the shingle. Provide a guarantee/ warranty in writing certifying the material from the date of acceptance.

No guarantee/ warranty is required for labor as roof will be installed by a National Park Service day labor crew.

PART 2: PRODUCTS

2-1 SHINGLES: Smooth sawn white oak shingles. Bundles shall be sized for 7 1/2 to 8 inch exposure to the weather. Shingles shall be 24 inches in length, 3 to 10 inches in width, 1/2 to 5/8 inch thickness at the butt end tapering to 1/16 inch at the taper end.

Shingles are to be produced only from mature white oak (Quercus alba L.) trees. All shingles will be edge grain, clear, and free from irregular grain, knots, splits, warps, and other manufacturing defects. Shingles shall not be kiln or air dried prior to shipping and shall retain a moisture content of 18 to 20 percent.

Recommended manufacturer: Oak Crest Manufacturing, Incorporated, 1405 East Emory Road, Knoxville, Tennessee 37938, (615) 938-1315 or 1-800-678-3145 or approved equal.

2-2 RIDGE UNITS: No prefabricated units will be allowed. Shingles will be as per above specification.
2-3 NAILS: Double hot-dipped zinc coated or galvanized shingle nails. Use 4d, 1 1/2 inch nails for installation. 1 1/2 pounds of nails per square is generally required for this type of shingle installation. Use 6d, 2 inch nails at the ridge.

2-4 ROOFING FELT: ASTM D226-82, Type I or II, 15 pound unperforated, asphalt saturated felt for use at ridge.

PART 3: EXECUTION

3-1 NAILING: Use two (2) nails per shingle, located approximately 3/4 inch from both side edges of the shingle, and approximately 1 inch above the butt line (exposure line) of the course line to follow. Verify that nails are long enough to penetrate the sheathing by at least 3/4 inch. Drive nails flush but not into the face of the shingle.

3-2 LAYING SHINGLES - GENERAL:

A. Shingles will be shipped green from the recommended manufacturer. Installation of shingles should be completed within 30 days of receipt. Once shingles are sawed they will air dry naturally within 30 days to a moisture content of approximately 15 to 18 percent. The shingles will become drier and harder the longer they are exposed to the environment. This may result in the need to either soak the shingles in water prior to installation or pre-drilling the nail holes to prevent edge splitting.

B. Installation: Installation shall be according to the manufacturers recommendations. NOTE: The recommended manufacturers literature contains the following information,

" The owners and employees of Oak Crest Manufacturing, Inc. have researched the techniques used for centuries by masters of the art. Continuing in local folklore, Oak Crest shingles (white oak shingles) are applied only when the moon is waning. Custom has it that if shingles are put on when the moon is full, they will curl up. And, surprisingly enough, this has been found to be true."

C. Substrate: Lay shingles directly on open (spaced) roof sheathing. Use no felt underlay or interlay.

D. Spacing: Lay shingles 1/4 inch apart.

E. Exposure: Lay shingles with 7 1/2 to 8 inch exposure.
F. Shingle Width: No shingle shall be used in the roof field which is greater than 6 inches in width. Shingles wider than 6 inches shall be sawn to narrower widths before using. Likewise, any shingle less than 3 inches in width shall not be used in the roof field.

G. Side Lap: Stagger joints between adjacent courses of shingles at least 1 1/2 inches. Avoid joint alignment between alternating courses. Stagger should be sufficient such that joints shall not line up until every third course.

3-3 TRIPLE STARTER COURSE:

NOTE: Physical evidence at the Boxley Mill indicates widely overhanging eave courses. It is important to verify these conditions before proceeding with the shingle installation.

Make the first course a triple layer of shingles, making sure that joints in all three overlapping rows are staggered.

A. EAVES: At the Southwest eave line project the first row of the triple starter course to overhang approximately 3 1/2 inches past the face board. At the Northeast eave project the first row of the triple starter course to overhang approximately 6 1/2 inches past the face board.

If physical evidence reported in the draft 1988 Historic Structure Report cannot be field verified, than proceed at the eaves with a 2 1/2 to 3 inch projection.

B. LINES: The triple starter course shall follow any existing deflection in the historic eave lines. Do not attempt to lay out the first courses with a straight edge but follow the historic roof lines. Any inconsistencies in these courses shall be worked out over the first eight courses. Starting with the ninth course begin to lay shingle butts along straight lines. Check lines every third or fourth course for alignment for the remainder of the roof field. Take out inconsistencies over two to three courses, do not attempt to straighten roof lines in one course.

C. FIRST ROW: The first row of shingles in the triple starter course at the eaves shall be cut to a 10 inch length measured from the taper end of the shingle. The butt end shall be saved for use finishing the ridge.

If it is field verified that the overhang at the Northeast eave measures 6 1/2 to 7 inches than the length of the first row shingle will have to be increased for this detail. This shingle shall be cut to measure 14 inches from the taper end.
The second and third rows are laid using full length shingles. The butt ends shall be flush with the eave line (formed by the first row of shingles). See sketch #1.

3-4 RAKE ENDS: Project shingles approximately 1 3/4 to 2 inches beyond the trim board at the facia. This is based on physical evidence reported in the 1988 draft HSR and shall be field verified. The edge shingle should be canted such that the shingle directs water back towards the center of the roof rather than over the rake boards. The outer edge of the shingle will be tilted slightly upward away from the ground.

This can be accomplished by nailing a shingle parallel to the sheathing boards with the butt end flush with the rake end of the sheathing boards. When the rake board is installed it shall be held flush to the underside of the shingles concealing the butt end of the canting shingle. See sketch #2.

3-5 RIDGE:

A. Center a thirty (30) inch wide strip of roofing felt over the sheathing at the ridge. Install two layers.

B. Match the historic shingle configuration at the ridge.

C. RIDGE COMB: If no detail exists, the windward side of roof shall overhang the leeward side of roof as determined by the microclimatic conditions at the job site (prevailing winds and storms as determined by topography).

Using an overhanging ridge course sometimes called a Boston Ridge, the last course of the windward side shall overhang the leeward (or opposite) roof slope a distance equal to the exposure of 8 inches.

D. EXPOSURE: The exposure of the shingles in the roof field shall be adjusted as the coursing approaches the ridge in order to maintain relatively even exposures at the ridge assembly. Shingles on opposite sides of the roof will be laid such that the butt ends overlap in alternating courses. For the last course on the windward side the shingles will be cut off to 16 inches measuring from the butt end.

Two layers of shingles shall comprise this last overhanging course and shall be laid out such that all gaps between shingles in the first overhanging course are covered by shingles in the second overhanging course. Both layers are of equal length. See sketch #3.

E. NAILS: Use 6d, 2 inch, nails for the ridge comb courses.

END 07313-4
TRIPLE STARTER COURSE
DETAIL OF EAVE # SKETCH #1.
Wood shingles showing triple coverage @ starter course

1 3/4" - 2" overhang, verify in field.

Butt end a parallel shingle (in section), typical 3/8" +/- butt thickness, field adjust.

New 1" x trim bd.

Rake bd @ facia

Sketch #2
Detail of rake

Not to scale
AMMENDMENT 1. 06/12/89.

ADD THE FOLLOWING INFORMATION TO PART 3: EXECUTION, SECTION 3-5 RIDGE, C. RIDGE COMB.

DELETE EXISTING PARAGRAPH C and REPLACE WITH NEW TEXT.

3-5 RIDGE:

C. RIDGE COMB: Photographic evidence(1) clearly indicates that the Boxley Mill was capped out with an overhanging ridge or ridge comb. The Northeast elevation (rear) clearly overhangs the Southwest elevation (front, as you approach the mill).

Using this overhanging ridge course, sometimes called a Boston ridge, the last course on the Northeast side shall overhang the Southwest roof slope a distance equal to the exposure of eight (8) inches. See sketch # 3.

END

1. Photographic evidence is derived from copy of enclosed photograph taken by Mr. Kenneth L. Smith, April, 1959.

Typical Exposure 7 1/2" to 8".

Use 6d Nails

1" x Roof Sheathing

7" Pole Rafter (Typ)

LeeWARD

WindWARD

Sketch #3

Ridge Detail

Not to Scale
APPENDIX 7.

Historic American Engineering Record Drawings

AR-3, 1986, 20 sheets
THE BOXLEY GRIST MILL IS AN EXAMPLE OF A ONCE COMMON INDUSTRY WHICH PROVIDED CUSTOM MILLING SERVICES IN RURAL AREAS. THE MILL, THOUGH DETERIORATING, STILL RETAINS THE MILLFORD RACEWAYS, MACHINERY, AND EQUIPMENT NECESSARY FOR A SMALL BUT IMPORTANT MULTI-PURPOSE INDUSTRY. LIKE MOST MILLS, BOXLEY MILL WAS SUBSTANTIALLY MODIFIED OVER ITS 140 YEARS OF OPERATION. THE MILL EXTANT TODAY DATES FROM 1870 WHEN IT WAS BUILT BY THE VOGTER FAMILY. A WOODEN, OVER-SHOT WATER WHEEL WAS REPLACED BY A METAL TURBINE WHEN THE MILL WAS CONVERTED TO A ROLLER MILL GRINDING PROCESS. A SMALL BARREL OF STONE BUILDING REMAINED UNTIL THE MILL'S HISTORY OF COMMUNITY SERVICEなんだした。THE TIME OF DOCUMENTATION, THE MILL WAS BEING STABILIZED BY THE NATIONAL PARK SERVICE.

This is a site plan and area map of Boxley Grist Mill, Ponca, Arkansas. The plan includes a portion destroyed by a flood and a section labeled as "Site Plan." The area map shows the mill's location within a larger map with surrounding landmarks. The site plan is dated c. 1870 and includes features such as a barn and millpond. The vicinity map provides a scale of 1" = 200' 0."
TIMBER FRAMING

The timber mainframe is primarily oak with secondary members of cedar. Frame quality, reflected in member finishing, joint construction, leveling, and other details, indicates a master craftsman was responsible for the heavy framing, but not for the less refined secondary framing. The original members were hand tooled and vary slightly in cross-section. The original timbers were probably salvaged and moved to the present site. The excessive length & displaced leveling patches of certain second floor joists suggest they were sized for third floor application. Various alterations to the structure were due to functional modifications or maintenance. The first floor was raised 14 inches, independently of the rest of the structure. Joists now vary from toenailed timbers to 8x8, 4x6, and 6x4. Apparently the flooring & siding were second generation, as the roof rakes have been extended. Framing shapes & placement indicate planning differs from originally planned. Over time, through neglect, wall, floor, & structural elements have deteriorated & moved out of line.

NOTE: Typical framing members are hand-hewn timber.
POWER TRANSMISSION SYSTEM

Illustrated is a reconstruction of the power transmission system for roller mill operation which supplanted the stone grinding of wheat. The remaining millstones were used to grind corn.

Assumptions were made as to the configuration of the second floor driveshaft & pulleys; the reduction roller mill & drive pulleys to both roller mills. Most of the equipment is in the mill but shifted from original location.

The turbine was driven at approximately 150 rpm by water from a spring-fed millpond. The water was carried by a 360-foot-long headrace flume to the turbine, then by the tailrace to a near-by creek.

See plans sheets 5, 3, 4, 3 for the reconstructed layout of equipment.
APPENDIX 8.

Denver Service Center Structural Drawings

173/ 41063, 1986, 2 sheets
APPENDIX 9.

Consultants Reports


BOXLEY GRIST MILL
BUFFALO NATIONAL RIVER
PONCA, ARKANSAS

Prepared for the National Park Service
Southwest Regional Office
Division of Conservation

Jeffrey Lundberg Brown, Historic Structures Consultant
42 Clovelly Road
Wellesley Hills, Massachusetts

November, 1986
The Boxley Mill is a post and beam structure using oak as its main framing material, supplemented with cedar and other indigenous soft woods. The post and beam technique uses a system of heavy timbers which are mortised and tenoned together. This technique was commonly used during the period in which the mill was built and makes a very sturdy and long lasting structure.

The original basic frame was cut by a master craftsman well versed in his trade. He designed and cut a frame for a three story building with minimal interior framing. The exterior walls of the main frame consist of 8X10 hand hewn oak sills, 8X5 hewn corner posts and 8X8 center posts. (as shown on drawings 13 & 17)

As it stands today the building shows evidence of several major alterations which were undertaken at different periods in its history and which reflect the changing ownership and needs of changing milling technology. These alterations may have been necessary to accommodate new machinery but they were done in such a manner as to greatly undermine the building's initial structural integrity. However, the evidence of its initial engineering and technical expertise are still apparent.

The first floor framing (drawing 13) was designed to carry a substantial amount of weight. The timbers used are approximately 8X10 hand hewn oak sill plates with center beams measuring approximately 9X11. These timbers were pocketed for floor joists that were approximately 4X8 hewn oak timbers.

Many of the original sills and joists have rotted or have been changed during alterations, including the raising of the first floor. This reduces the effectiveness of the original design. The flooring material that presently exists is probably very similar to the original 1" to 1½" rough board.
The second floor framing (see drawing 13) is in much better condition. It consists of 7"X7" hewn oak top plates, an 8"X8" oak center beam which is supported in two places by 9"X10" oak columns.

The floor joists are approximately 6"X6" oak timbers, that are notched to fit over the upper plate and center beam. Hand hewn timbers are not uniform in dimension and therefore require this notching to level the floor system and to aid in tying the building together. The floor at this level is similar to the first floor consisting of 1" to 1½" random boards. (see drawing 4)

The third floor, being the top floor of the basic frame, has three purposes. (see drawing 14) The framing timbers on this floor are not designed to carry a great deal of weight. Their main purpose being to tie the building together and, in this case, to support the roof rafters. The rafter plate is a 6"X7" timber supported by the corner and center posts. The 8"X10" center beam runs the full length of the building and effectively ties the structure together from end to end. The 5"X6" (approx.) floor joists are notched over the rafter plates and center beam, tying the building together from side to side. (drawings 13 & 15) The flooring in this level was applied only where necessary to carry the machinery.

The rafters are one sided cedar poles notched and pegged at the top and resting on the third floor joists. (see drawing 14 detail A&B)

The roof is sheathed with 1" random width and length boards. (see drawing 12, cornice detail)

The secondary framing of the building does not show the skill or craftsmanship of the main frame. The intermediate posts (or studs) are approximately 4" poles hewn on two sides. These studs fit into pockets in the sill and plates to create nailing for the exterior siding. (drawing 12, cornice detail) The studs are placed approximately 3" apart with allowances made for window and door openings. (see drawing 15 & 16, framing elevations)

The exterior siding is ½"X6" clapboards nailed over the frame and are in need of major repair. The windows and doors are of a very functional and simple design. The exterior trim details are
The foundation consists of dry laid stone and retaining wall piers. (drawing 2, groundplans & drawings 6,7,8, & 9, elevations) These piers have shifted and broken down over the years and need to be relaid.

The roof is 1" random boards nailed over the rafters, and originally shingled with hand split shingles. There is now a sheet metal roof in place over the remaining shingles.
RECOMMENDATION FOR FUTURE WORK & USE

The historical and architectural significance of the Boxley Mill would indicate that additional restoration work on the building and site should be undertaken.

The building itself is in need of immediate attention. The first concern should be to the foundation and additional straightening of the building. The present foundation consists of dry laid piers which over the years have shifted and fallen down. These need to be rebuilt from the ground up. This could be best accomplished by using the existing temporary support structure to rebuild the piers one segment at a time. The corner and center stone piers should be rebuilt first, followed in any order by the remaining posts. If this is not completed soon, it could jeopardize the restoration work which has already been completed.

In conjunction with the foundation repairs, the task of straightening the building should be undertaken. This would involve using the temporary support system to shift and correct the misalignment of the building.

The second concern should be to the roof. The existing metal roof seems to be shedding most of the water, however, it will not be long before it develops new problems. The roof should be reshingled and repairs done to the rake and soffit trim at the same time.

The third concern involves the many openings to the weather that time and the elements have created. Doors and windows need to be repaired and/or replaced, holes in the existing siding need repairs and missing siding needs to be replaced. The majority of the exterior trim is still intact and repairable. Of course, any missing areas of trim will need to be replaced.
The doors are constructed of very simple material and
are easy to repair or replace if necessary. Most of the windows
are either broken beyond repair or are missing. These should be
replaced with similar sash.

The siding shows need for repairs on all areas of the
building. This would require removal and repair for some of the
clapboards and reinstallation. Other areas will need to be renailed
and still other areas are rotted and damaged beyond repair and in
that instance will need to be replaced entirely in order to create
a sound weather tight shell.

The aforementioned work is a brief description of the
immediate first needs of the structure known as the Boxley Mill.
This work will restore the exterior of the building and recreate
a sound foundation. I can not emphasis more, that although the work
described above may be time consuming, it is essential that it be
undertaken soon to insure that this "relic of once common local
industry" is still standing in the years to come.
THE MILL SITE AND MILL POND AND DAM

The overall mill site should be considered as a possible attraction for residents and visitors to the local community to experience a small and colorful piece of Arkansas history. This site represents a cultural and financial benefit to the community for two reasons. First, the mill itself depicts a type of industry that was once common to the area but has since been replaced by technological progress. In fact, it represents a necessary component of an ongoing process of industrial growth and advancement. The mill can be seen as a model or symbol of an era that is rich in historical significance. Quite simply, it is something we should remember and there is a great deal of interest for this.

Secondly, because the public interest for such an attraction would be substantial, the mill and pond site serve as a draw for visitors to the area who would not otherwise come, and whose presence will benefit the local economy. If the mill could be brought back to a more presentable condition, it would be a definite visitors point of interest.

In order to make this site a visitors attraction it will be necessary to do a considerable amount of site work on the mill pond and dam. The pond would need to be drained to make it possible to do the necessary repairs to the dam and upper portion of the raceway.

The lower portion of the raceway was washed away during the last major flood and needs to be rebuilt. The concrete turbine box is still intact but the wooden parts need to be replaced. The tail race is silted in and needs to be excavated.

Other needs to consider in the restoration for public use would be to give additional attention to the interior of the mill. The extent to which this would be done would depend on funding. Lastly, it may be necessary to make provisions for public parking and sanitary facilities, as well as handicap access.
BOXLEY GRIST MILL
BUFFALO NATIONAL RIVER
PONCA, ARKANSAS

Roller Flour Milling Process
Explanatory Notes & Report of Inspection

Prepared for the National Park Service
Southwest Regional Office
Division of Conservation

Charles Howell, Millwright
Manitou Machine Works
Cold Spring, New York

July, 1986
The schematic flow of the wheat and stock through the roller flour system at Boxley Mill as shown on the attached drawings, was arrived at by mainly following the various spouts which are still in position, or are attached to the dressing reels (bolters). However, since the roller mills are not in operating position, nor is any wire or silk screening material remaining on the various reels, it was not possible to tell exactly how the stock flow was processed. The drawings do however, give a good general idea as to how flour was milled at Boxley.

Usually on a short system as used at Boxley Mill, the bran would not be sifted out until the stock had passed through the second break roll, and often there were other variations in the sifting process. Also, in many short system roller flour plants there are additional small machines, such as middlings mills, incorporated into the process.

Since Boxley Mill in its working days was in a rather remote country district, there may not have been much incentive to obtain a maximum extraction of finished white flour from the wheat. Locally there would have been a good demand for the by-products, namely bran and shorts, for farm livestock feeds. Probably, this was one of the reasons why the flour milling machinery at Boxley remained a simple process, although the flour produced would have been of a fairly high quality. The capacity of the mill would have been around 25 barrels of flour in 24 hours, a standard barrel of flour weighs 196 pounds, or 14 stones by the old British weights.

The above notes by Charles Howell,
331 Bellwood Avenue,
North Tarrytown,
New York 10591.

The inspection of Boxley Mill was carried out on July 8th, 9th, and 10th, 1936.
PRELIMINARY INSPECTION

July 8th through July 10th, 1986

for the

NATIONAL PARK SERVICE, BUFFALO NATIONAL RIVER

BOXLEY MILL

WATER WHEEL: Water wheel was probably overshot about 10 feet in diameter and 4 to 5 feet wide. It appears that the initial drive was made by a cast iron segmental spur gear mounted on the inner arms of the water wheel which drove into an iron pinion on a line shaft. The evidence for this gear drive is in the form of a section of the segmental spur gear lying in the back of the mill building.

MILLSTONES: At present there are one pair of 36 inch diameter French Burr (stones) which are equipped with a "Silent Feed", rather than the more usual damsel and shoe feed system. The drive for the millstones is by pulley and quarter-twist belt from the lineshaft in the mill basement. The "hush" or hurst frame is of stout oak timbered construction and is built to accommodate two pairs of stones with which the mill was fitted when rebuilt in 1870.* It appears that the millstones were the last machinery to have been used in the mill with the servicing elevators. The last grain ground was corn and coarse grain for animal feed. (From physical evidence at the stones.)


TURBINE: This operated under approximately 13 feet of head (based on physical evidence at the site). It is of the cylinder gate type, its' runner appears to be about 12 inches in diameter. There are no makers' name(s) on the machine, but (it) appears very much like a "Rome" turbine which was manufactured in Georgia. This turbine was probably installed in the 1890's when the roller flour system was fitted. This bevel gear drive from the turbine is a very light cast iron construction.

ROLLER FLOUR PLANT: The existing double roller mill was manufactured by "The Graham Roller Mill", Patent, August 19th, 1890. The patent date suggests that the roller system was installed in Boxley Mill in the early 1890's although there may have been an earlier roller flour system, but this is doubtful.
The existing roller mill contains two sets of "break rolls". It would seem judging by the number of elevators that the roller system was a short process, probably consisting of the two sets of break rolls and two sets of reduction rolls.

These reduction rolls would be in a [further] double roller mill machine, which machine is believed to have been taken away to process animal feed.

ELEVATORS: There are seven (7) sets of elevators all of small capacity. Five (5) sets are operated by a common head shaft, all these appear to have head pulleys of about 12 inches diameter, and the cup belts are of canvas compound. The five (5) sets of elevators on the common head shaft were all used in connection with the roller flour system and with the two (2) grain cleaning and scouring machines. Possibly the raw grain elevators which fed the grain cleaners also at one time fed the millstones.

Another set of elevators of an earlier design brought the meal up from the millstone delivery spout in the basement to the first floor for bagging. A further set of elevators were used to lift grain from the first floor to feed a hammer mill, now removed, which ground grain for animal feeds. This was probably one of the last processes which was carried out at the mill in its final commercial use. All the elevators are equipped with wooden "legs" in which the belts and cups run.

GRAIN CLEANERS AND SCOURERS: There are two of these, both are manufactured by the S. Howes Co. of Silver Creek, New York, possibly at that time the company was known as "Howes & Ewell". One machine is a vertical machine and the other is horizontal. They were possibly both termed "SEPERATING & SPECIAL CLOSE SCOURING MACHINES". Both machines are almost complete except for a few small fittings.

DRESSING REELS (OR FLOUR BOLTERS): There are four (4) of these. Two are Hexagonal Reels and two are Round Reels. As the name suggests, the hexagonal reels have a six-sided "cylinder", whereas the round reels have a round cylinder. Probably the hexagonal reels were used in the earlier millstone process to sift the wheat meal into flour, short and bran. When the roller system was installed in the 1890's, the two hexagonal reels were fitted as part of the sifting process but were supplemented with the two round reels for the final stages of the sifting process.
SUMMARY: I worked out the approximate grain and flour flow system through the mills elevators and machinery with the architectural students making the drawings on behalf of the Historic American Engineering Record. These drawings will show the passage of the grain and "stock" through the millstones, the grain cleaning and scouring system, the roller system of two break rolls and two reduction rolls for grinding the wheat, and the connections to the elevators which serviced the four dressing reels. Also, the final delivery of the flour, shorts and bran to the bins.

Finally, I will check the completed drawings for completeness of detail, when these drawings are available. If time is available, I could then make a complete and detailed report on all the machinery and processes which were used at the Boxley Mill. However a detailed report would be a separate matter to this preliminary inspection and training session.

Charles Howell
July 11th, 1986

Attached illustrations of similar machinery:

The Fitz Wheel with Segment Gear, The Fitz Water Wheel Co's. Catalogue, Hanover, Pennsylvania 1923.

Cylinder Gate Turbine

The Eureka Adjustable, Upright, Close Scouring Polishing and Seperating Machine, from S. Howes catalogue, Silver Creek, New York 1892.

Eureka Smut and Seperating Machine (Howes and Babcocks Patent), from a British agent who sold "Eureka" machines, Messrs Whitmore and Binyon's catalogue about 1880.

The Hexagon Reel, from "Practical Milling" by Prof. B. W. Dedrick, Pennsylvania State College, USA, published by "National Miller", Chicago, 1924.

The Round Reel, IBID.

Nordyke & Marmon Company

FLOURING MILL ENGINEERS,
IRON FOUNDERS AND
MACHINISTS,

INDIANAPOLIS, INDIANA, U. S. A.

CONTRACTORS FOR THE ERECTION OF
COMPLETE
FLOUR MILLS,
FINE CORN GOODS MILLS,
RYE FLOUR MILLS,
BUCKWHEAT FLOUR MILLS,
CEREAL MILLS,
OF ANY CAPACITY.

MANUFACTURERS OF

FLOURING MILL MACHINERY

PORTABLE BUHR-STONE MILLS,
ROLLER CORN AND FEED MILLS,
MILL SUPPLIES,
POWER CONNECTIONS, ROPE DRIVES, ETC.

CABLE ADDRESS: "NORDYKE, INDIANAPOLIS."
CODES USED: A B C, LIEBER'S AND WESTERN UNION.

Reprinted in 1987 by The Society for the Preservation of Old Mills.
GEARING.

We have patterns for all kinds of gearing, and a large number of sizes of each. Our gear list is extensive. Besides the gearing illustrated herein, we are prepared to furnish bevel, miter and spur gearing cut from blanks. For this purpose we have the latest improved automatic gear-cutting machines.

BEVEL MORTISE GEARS.

Bevel Core Wheel. Bevel Pinion. Light Mortise Wheel.

BEVEL GEARS.

SPUR MORTISE GEARS.

MITER GEARS.

SPUR GEARS.
With what was formerly overshot about 10 feet in diameter and 4 to 5 feet wide. It appears that the initial drive was by a cast iron segmented spur gear mounted on the inner arm of the water wheel which drove into an iron pinion on a line shaft. The evidence for this gear drive is in the form of a section of the segmented spur gear lying in the base of the mill building.

Millstones. At present there are one pair of 36-inch diameter French Burr which are equipped with a "Silent Feed," rather than the more usual damsel and shoe feed system. The drive for the millstones is by pulley and quarter-twist belt from the lineshaft in the mill basement. The "kush" or burst frame is of stout oak-timbered construction and is built to accommodate 9 pairs of stones with which the mill was fitted when rebuilt in 1870. It appears that the millstones were the last machinery to have been used in the mill with the conveying elevators. The last grain ground was corn and coarse grain for animal feed.

Turbine. This operated under approximately 13 feet of head. It is of the cylinder gate type, its runner appears to be about 12 inches diameter. There are no maker's name on the machine, but appears very much like a "Rome" turbine which was manufactured in Georgia. This turbine was probably
Boxley Mill (2)

Installed in the 1890's when the roller flour system was fitted. The belt gear drive from the turbine is of very light cast iron construction.

Roller Flour Plant

The existing double roller mill was manufactured by "The Graham Roller Mill," Patent August 19th 1890. The patent date suggests that the roller system was installed in Boxley Mill in the early 1890's, although there may have been an earlier roller flour system, but this doubtful. The existing roller mill contains 2 sets of broken rolls, it would seem judging by the number of elevators that the roller system was a short process, probably consisting of the two sets of broke rolls and two sets of reduction rolls. These reduction rolls would be in a further double roller mill machine, which machine is believed to have been taken away to process animal feeds.

Elevators.

There are 7 sets of elevators all of small capacity, 5 sets are operated by a common head shaft, all these appear to have head pulleys of about 12 inch diameter, and the cup belts are of canvas compound. The 5 sets of elevators on the common head shaft were all used in connection with the roller flour system and with the 2 grain cleaning and dehulling machines. Possibly the raw grain elevator which fed the grain cleaners, also at one time fed the millstones. Another set of elevators of a
earlier design brought the meal up from the millstone delivery shoot in the basement to the first floor for bagging. A further set of elevators were used to lift grain from the first floor to feed a hammer mill, which ground grain for animal feed, this was probably one of the last processes which was carried out at the mill in its final commercial use. All the elevators are equipped with wooden legs in which the belts and cups run.

**GRAIN CLEANERS AND SCOURERS**

There are 2 of these; both are manufactured by the S. Howe & Co., of Silver Creek, New York, possibly at that time the company was known as "Howe & Swell". One machine is a vertical machine and the other is horizontal, they were possibly both termed "SEPARATING & SPECIAL CLOSE SCOURING MACHINES". Both machines are almost complete except for a few small fittings.

**DRESSING REELS (OR FLOUR BOLTERS).**

There are 4 of these, 2 are Hexagonal Reels and 2 are Round Reels. As the name suggests, the hexagonal reels have a six-sided "cylinder", whereas the round reels have a round cylinder. Probably the hexagonal reels were used in the earlier millstone process to sift the wheat meal into flour shots and bran. When the roller system was installed in the 1890's, the 2 hexagonal reels were fitted as part of the sifting process but...
were supplemented with the 3 Round Rolls for the final stages of the sifting process.

I worked out the approximate grain and flour system through the mill's elevators and machinery with the architectural students making the drawings on behalf of 'The Historic American Engineering Record.' These drawings will show the passage of the grain and stock through the millstones, the grain cleaning and scouring system, the roller system of 9 break rolls and 2 reduction rolls for grinding the wheat, and the connections to the elevators which serviced the 4 dressing reels. Also, the final delivery of the flour, shorts, and bran to the bins.

Finally, I will check the completed drawings for completeness of detail, when these drawings are available. If time is available I could then make up a complete and detailed report on all the machinery and processes which was used at Boxley Mill. However a detailed report would be a separate matter to this preliminary induction and training section.

Charles Powell,
July 1st, 1986.

Attached illustrations of similar machinery.
The Fitz Wheel With Segment Gear

Example of segmental gearing, from The Fitz Water Wheel Co's Catalogue, Hanover, Pennsylvania 1923.
CYLINDER GATE TURBINE

Uses less water per horse power than any other Water Wheel.
Illustrations and descriptions from S. Howes catalogue, Silver Creek, New York, U.S.A. 1892.
through a strong upward current of air which entirely removes all dust and light foul stuff. Another peculiar and most excellent feature in its construction and operation is the separation after the scouring process, the wheat being passed through a very strong suction current of air which entirely removes all dust, leaving the grain clean and bright. The separating qualities are so perfect that we hazard nothing in saying to our friends and the milling public generally, that they will make no mistake in adopting it, as it will be sold on approval and under a strong guarantee. We have sought to combine extreme durability in its construction, with perfect operation, and it is offered to the milling public with the assurance that it possesses more desirable and commendable features than any machine for similar purposes now on the market. Every bearing is in plain sight, readily and easily accessible, and so placed that all danger from fire, originating in the machine, is effectually avoided. Every part in sight, or out of sight, is perfectly and accurately fitted and finished.

In ordering, please state whether you want it with or without shoe and whether to run with or against the sun.

Sizes, Capacities, Dimensions and Prices.

<table>
<thead>
<tr>
<th>No. 0</th>
<th>No. 1</th>
<th>No. 1½</th>
<th>No. 2</th>
<th>No. 3</th>
<th>No. 4</th>
<th>No. 5</th>
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<tbody>
<tr>
<td>Ext. Height</td>
<td>56.0</td>
<td>62.0</td>
<td>68.0</td>
<td>72.0</td>
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<td>84.0</td>
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<td>47.0</td>
<td>54.0</td>
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<tr>
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<td>48.0</td>
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<tr>
<td>Size on Floor</td>
<td>22.2</td>
<td>32.2</td>
<td>36.2</td>
<td>36.2</td>
<td>32.2</td>
<td>30.2</td>
</tr>
<tr>
<td>Hgt. to where grain falls on shoe</td>
<td>5 3</td>
<td>5 3</td>
<td>5 3</td>
<td>5 3</td>
<td>5 3</td>
<td>5 3</td>
</tr>
<tr>
<td>Hgt. to where grain enters, no shoe</td>
<td>4 3</td>
<td>5 3</td>
<td>5 3</td>
<td>5 3</td>
<td>5 3</td>
<td>5 3</td>
</tr>
<tr>
<td>Motion per minute</td>
<td>650</td>
<td>600</td>
<td>550</td>
<td>500</td>
<td>450</td>
<td>400</td>
</tr>
<tr>
<td>Hgt. to center drive pulley</td>
<td>1 1</td>
<td>1 1</td>
<td>1 1</td>
<td>1 1</td>
<td>1 1</td>
<td>1 1</td>
</tr>
<tr>
<td>Sizd. Pulleys</td>
<td>66 ½</td>
<td>74 ½</td>
<td>103 ½</td>
<td>103 ½</td>
<td>125 ½</td>
<td>143 ½</td>
</tr>
<tr>
<td>Diam. of shaft for pulley</td>
<td>2 3/16</td>
<td>2 3/16</td>
<td>4 3/16</td>
<td>4 3/16</td>
<td>6 3/16</td>
<td>8 3/16</td>
</tr>
<tr>
<td>Capacity per hour in bush.</td>
<td>8 12</td>
<td>9 12</td>
<td>10 12</td>
<td>11 12</td>
<td>12 12</td>
<td>13 12</td>
</tr>
<tr>
<td>Shipp'g Wgt.</td>
<td>65 lbs.</td>
<td>80 lbs.</td>
<td>100 lbs.</td>
<td>120 lbs.</td>
<td>140 lbs.</td>
<td>160 lbs.</td>
</tr>
<tr>
<td>Price, no shoe</td>
<td>$120</td>
<td>$120</td>
<td>$120</td>
<td>$120</td>
<td>$120</td>
<td>$120</td>
</tr>
<tr>
<td>Double Sep'rs</td>
<td>$120</td>
<td>$120</td>
<td>$120</td>
<td>$120</td>
<td>$120</td>
<td>$120</td>
</tr>
</tbody>
</table>

In the matter of prices we do not claim to be able to compete, but we can assure intending purchasers that it will give us pleasure to correspond with them in reference thereto, and we are confident such correspondence will result advantageously to the would-be buyer.

Further description from S. Howes catalogue, Silver Creek, New York, U.S.A. 1892.
"EUREKA" SMUT AND SEPARATING MACHINE,

*HOWES & BARCROFT'S PATENT.*

Patented in United States, Great Britain, France, and other parts of Europe.

**DESCRIPTION & PRICE LIST**—Packed and Delivered to the London Railways.

<table>
<thead>
<tr>
<th>No.</th>
<th>Height from Wheel to Floor</th>
<th>Size of Food</th>
<th>Motion of Ends</th>
<th>Diameter of Cylinder</th>
<th>Height from Ends to Centre of Cylinder</th>
<th>Capacity per Hour</th>
<th>Weight of Machine in Pounds</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Feet</td>
<td>Inches</td>
<td>Feet</td>
<td>Feet</td>
<td>Feet</td>
<td></td>
<td></td>
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<tr>
<td>0</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>4 to 6 inches</td>
<td>600</td>
<td>520</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>6 to 8 inches</td>
<td>600</td>
<td>520</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>10 to 12 inches</td>
<td>600</td>
<td>520</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>14 to 16 inches</td>
<td>600</td>
<td>520</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>18 to 20 inches</td>
<td>600</td>
<td>520</td>
</tr>
</tbody>
</table>

**TERMS**—Parties ordering the above Machines will be allowed a trial of thirty days. If entire satisfaction is not given, they will be returned within that time to notify the agent from whom ordered and he may give his personal direction, after which, if satisfaction is not given, no payment will be required, but the Machines must be delivered free of charge at the nearest Railway Station, subject to order of the Agent.

In ordering Machines, be particular to give full directions—No. of Machine; with or without shelf to run with or against the sun. Also give full directions for forwarding. Envelope.

A. Iron Works, Wickham Market, Suffolk; and 14,15,16, London, E.C.

From a British agent who sold "Eureka" machines, Messrs Whitmore and Binyon's catalogue about 1830.
The Hexagon Reel—As its name implies, the hexagon reel has six sides or faces. Figs. 123 and 124 present this reel and an end sectional view. At the left of Fig. 123 is a section of the head end of reel and frame. The letter H indicates the head of reel. This, as shown, is made of wood and circular in form. The ribs E are mortised or joined into this head, and strips fastened to the head and between ribs, as at the tail end, where E represents the tail strip or slat, which is fitted between and to the ribs, this strip being flush with the top of rib. The position of these strips at head is shown by the dotted line.

The cloth at both head and tail end is tacked to these strips, the cloth being stretched over the ribs and sewed and then tacked to rib. Fig. 123 shows the silk cloth in place on the reel. At both head and tail ends of cloth, ticking or webbing is sewed to the silk the full length of the edge of each end. This ticking may be an inch and a half to two or possibly three inches in width and it is the ticking that is tacked onto wooden strips or slats, where the cloth comes onto or over the rib. Strips of ticking are sewed, reaching the full length from head to tail end, the ticking being the width of the rib. Tacks are driven in at intervals along the rib to keep the cloth in position and from shifting. The ribs are presumed to be, or rather should be equidistant from center to center, in order to have all the strips of ticking come exactly on the ribs.

One side of a hexagon reel is equal to half the diameter of the reel. Some, particularly the old type of reels, were open at the head, the spout being introduced well within the reel. In this example this opening is closed by the filler h. The head is beveled inward, and the filler beveled likewise, and fits very close to the head. Sometimes sheepskin with the wool on, is tucked around the edge, thus making a leak proof joint. The filler h is stationary, being supported or held in position by the spout a or other means, the reel head of course revolving around the rim of filler. The hole in filler, through which the shaft is introduced, is sufficiently large to give clearance to shaft.

Usually the spiders U at ends that support the ribs are set back some distance from head and tail end. In the old days, with the open head, the chop was liable to splash out, and speck the flour. To obviate this a speck or slop spout g was introduced by placing a partition at D, as shown at left in Fig. 123. This partition has a circular opening as in detail D shown below reel, slightly larger than the diameter of reel. The space g was in some of the old reels led to a spout that discharged to one side or out through the end, somewhat as the tail discharge of a centrifugal.

In Fig. 124 is shown the end view of the hexagonal reel. The feed is gathered on this side reaching a little beyond the center, then carried upward at an incline by the united force of the motion and the ribs. The ribs stir up the mass as it passes through or under and, if of the usual shape, act as an elevator, carrying stock to or almost to the top of reel and dropping its load into the mass below. If very soft stock, some may be carried far enough to drop beyond the center. Sharp material like bread stock, or middlings will not be carried over the center unless the speed of reel is faster than necessary.

The changing of the sides of a reel from a horizontal plane to varying inclinations or angles is continuous and rapid. This constant changing of position agitates the stock, giving a sort of pounding action in addition to the stirring action of the ribs. It is often unnecessary to have any shoveling device used in connection with hexagonal reels, the action of the stock in the reel keeping the meshes clear or open. Ordinarily all that is necessary is to have a top. This is a piece of heavy cloth hung above the reel its entire length over the center and long enough to hang down and wrap the reel as far as shown in Fig. 124. Sometimes burlap was employed topping each rib at a certain point, as for instance at the top.

The sketch shows two conveyors side by side. One is the flour conveyor and the other the cut-off conveyor. The flour is turned cutting or throwing the flour at that particular point into the stock, or conveyer L is the conveyer for CF the begging or vanes boards of real flour. As S is shown the spent introduced into head of reel. The observer is on side of reel looking upward, the tail end to head. The outlines of this hexagonal reel are shown as in an end view at the bottom.

layer of stock is gathered on the side reaching a little beyond the center, thence carried upward on an incline by the pattern force of the motion and the ribs. The ribs stir up the mass as it passes through, or under, and, if of the usual shape, act as an elevator carrying stock to or almost to the top of reel and dropping its load into the mass below. If very soft stock, some may be carried far enough to drop beyond the center. Sharp material like thread stock, or middlings will not be carried over the center, unless the speed of reel is faster than necessary.

The changing of the sides of a reel from a horizontal plane to varying inclinations or angles is continuous and rapid. This ever constant changing of position agitates the stock, giving it a sort of pounding action in addition to the stirring action of the ribs. It is often unnecessary to have any cleaning device used in connection with hexagonal reels, the action of the stock in the reel keeping the meshes clear or open. Ordinarily all that is necessary is to have a wiper. This is a piece of heavy cloth hung above the reel its entire length near the center and long enough to hang down and wrap the reel as far as shown. Fig. 124. Sometimes knockers were employed tapping each rib at a certain point, as for instance at the top.

The sketch shows two conveyors side by side. One is the flour conveyor and the other the cut-off conveyor. The valve is turned cutting or throwing the flour at that particular point into the cut-off conveyor. L is the conveyor to CB the hoppering or cant boards of real chest. At S is shown the spout introduced into head of reel. The observer is supposed to be looking through from the tail end to head. The discharge of this hexagon reel is open, that is, direct from end of reel at bottom.

The Round Reel—Fig. 125 shows a side view and Fig. 126 the end view of a round reel with carriers or inter-elevators. This reel, as the name implies, is cylindrical in form. The spider S has a ring or casting upon which are supported the standards which in turn support the iron band or hoop over which the cloth is stretched. To it is also attached the carrier or bucket which extends from head to tail. These carriers elevate the stock gathering it at the bottom and discharging it when well beyond the center at top; descending side as illustrated in the end view. These carriers have a slight twist (the reel being horizontal) so as to gradually work the stock in the direction of tail. These buckets do not reach quite to the cloth, thus leaving a layer of stock next the cloth undistributed, subject only to a natural rolling action.
The round reel is very much more gentle in action than the hexagonal or octagonal reel. The round reel without the elevation device is even more gentle; the stock being carried up the ascending side, to a certain distance then sliding or curling back the lighter material containing the branny or fibrous material riding on the top of the mass; but it has even less capacity than the hexagon reel.

The inter-elevator reel has considerable more capacity, about half the the surface being utilized, the heaviest bolting being done at the bottom and ascending side. This reel has what is known as a central feed and discharges which will be observed in the cut side view. At the head and tail are conveyors fixed on the same shaft that carries the reel itself. At both ends are conveyor boxes or spout openings into the conveyor at head. At the tail the stock is caught and lifted up by buckets somewhat similar to the ordinary elevator cup, more shallow and in the form as shown at E, Fig. 126. On reaching a point almost directly over the conveyor box H, which is flared, the cup discharges its load. The tailings are conveyed and discharged through the tail spout at end. A sprocket on the end reel shaft at tail end, and sprocket on conveyor journal end, and afford means of turning the conveyors by sprocket chains, this being the ordinary method.

At Fig. 125 is also shown a view of the frame, as the latticed doors covered inside with muslin or cheese cloth affording ventilation to interior of reels; the hipping or cast-board; the conveyor box and lids. The frame or hutch of the three different machines would present the same appearance in an outside view. A revolving brush B placed at the top on the descending side keeps the cloth clean and meshes open.

The Centrifugal Reel—A sectional view of a centrifugal reel is shown in Fig. 127 while Fig. 128 displays the end view. The centrifugal is a force bolter. This is apparent when we observe the action of the beaters, throwing the material with considerable force at an angle, thus propelling the finer particles of the material being bolted through the meshes of the cloth. The whole surface, or nearly so, of the silk cover is thus utilized, and gives the centrifugal the largest capacity of all types of reel bolters.

The beaters revolve within the cylindrical reel at a very much greater speed and also in the same direction as the reel itself. The beaters revolve about 200 r. p. m. and the reel about 36 to 35 r. p. m.

In the present examples the reels are 24 inches in diameter. The shafts h b (Fig. 127), both at head and tail are hollow and turn in the journal boxes b b. These hollow shafts support and turn the reel by means of a widely extended U-shaped spider at the head end of the cylinder. At the tail a small iron spider carries a solid wooden disc E that supports the rod R at tail end t t. This machine was designed to illustrate the principle of construction.

The U-shaped spider allows the stationary conveyor box to project a short distance within the reel beyond the head, this disk fitting very closely all around the conveyor.
EDW. P. ALLIS & CO., Milwaukee, Wis.
Mill Builders and Furnishers.


THIS ROLLER MILL

For Grinding Middlings will accomplish its work as fast as a four foot pair of mill stones, and with less power:

RUNS NOISELESS,

with a smooth, steady motion, and will be subject to little wear and tear.

It is run at a higher speed, and performs its work under less pressure than other rolls.

AND WITHOUT HEAT:

It has no tendency to clog, but makes a fine granular flour.

Softening a Large Percentage Once Through

The Rolls.

The belts are run over pulleys twice the diameter of the rolls, and

THE DIFFERENTIAL SPEED IS POSITIVE,

and may be turned to suit the nature of the material being softened.

Being without fear, the machine is noiseless, and by the

Steady, Smooth Motion,

the friction on the bearing is less than would otherwise result.

THOUSANDS:

Of these Porcelain Rollers

Are Now in successful Operation

In all parts of the world.

Having recently at great expense made a thorough investigation into the best methods of milling practiced in Europe, visiting personally many of the largest and most

mills there, we are prepared to design and erect new mills, or to change over old mills to the Gradual Reduction or Hungarian System. This system admits of better yield

and much finer quality of flour than any practiced here, and is being rapidly introduced by our most progressive and successful millers. We have a full assortment of Smooth

and Corrugated Roller Machines, Violet and Old Stock Mill Stones, Dufour Holting Claths and Grit Gauzes, and can furnish on short notice Iron Harsts, and General Mill Ma-

chinery—all at lowest market prices.

SELFF-ACTING PRESSURE

AND-

Differential Speed

COMPLETELY

Superseding Mill Stones

FOR THE

ENTIRE REDUCTION OF

Fine & Coarse Middlings, Tailings and Brian

PRODUCING

Far Superior Results

AS TO

QUALITY OF FLOUR,

QUANTITY OF PRODUCE,

AND-

SAVING OF MOTIVE POWER,

AND AVOIDING THE

Discoloration and Caking of the Flour

INSEPARABLE

FROM THE USE OF METAL ROLLS.

EDW. P. ALLIS & CO., Milwaukee, Wis.