

# Rehabilitating Historic Timber Transportation Structures At Burnt Cabins Grist Mill, Burnt Cabins, Pennsylvania

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## Abstract

Burnt Cabins Grist Mill is an operating, water-powered grist mill on Little Aughwick Creek in Fulton County, Pennsylvania. The mill and ten acres of the privately owned site are listed on the National Register of Historic Places. Two heritage timber transportation structures were redesigned to combine traditional timber construction techniques with modern materials, treatment and construction methods, including:

1. a timber mill race flume; and
2. a timber weigh station canopy and timber scale bed.

The project was partially funded by the USDA Forest Service Rural Development Program.

Keywords: Burnt Cabins Grist Mill, National Historic Register Site, Fulton County, USDA Forest Service, Southwestern Pennsylvania Heritage Preservation Commission, Mill Race

## History

The Village of Burnt Cabins enjoys a colorful transportation history, in which the historic mill site plays a significant part. Burnt Cabins Grist Mill is located in a narrow pass on the western side of

Tuscarora Mountain, approximately three miles from the Pennsylvania Turnpike Tuscarora Tunnel. The Tuscarora ridge, and the pass through Burnt Cabins, were major Native American thoroughfares. European migration is first documented through Burnt Cabins by Scottish-Irish immigrants traveling west from Maryland.

Originally called Sidneysville, the name Burnt Cabins comes from timber structures which early settlers had built upon land not yet purchased from the natives. In 1750, the provisional governor ordered that these cabins be burned in an attempt to appease the natives and prevent bloodshed. White settlers soon returned.

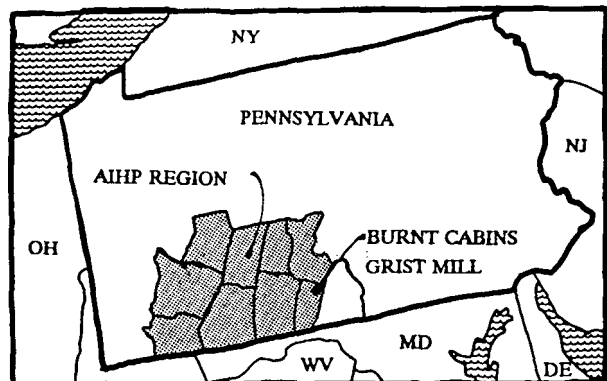
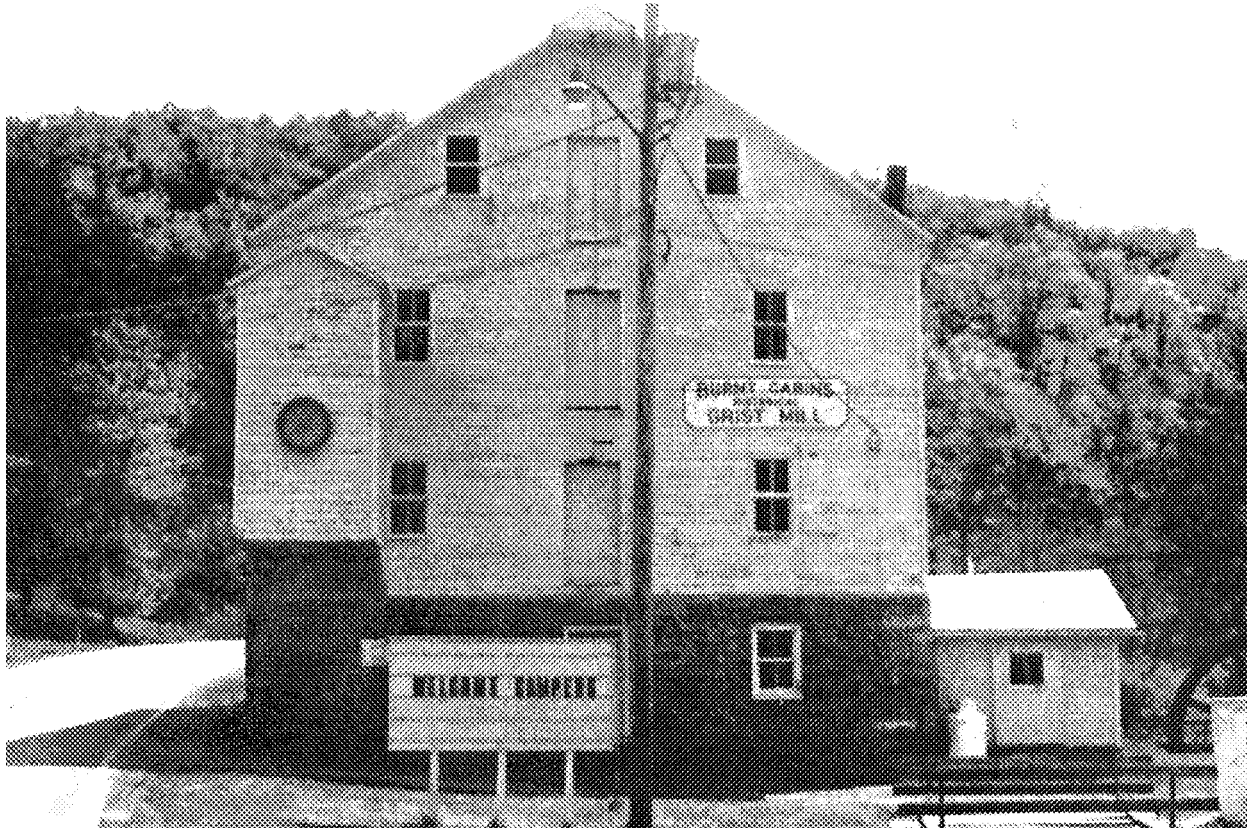


Figure 1 - Location Map



**Figure 2 - Burnt Cabins Grist Mill, West Elevation, 1995 (Note: scale bed at lower left.)**

During the French and Indian War, the British General John Forbes constructed his military road over Tuscarora Mountain and through Burnt Cabins. He erected Fort Littleton (now a turnpike exit) five miles to the west. Tax records indicate that the first grist mill at Burnt Cabins was operating by 1770. Ruins of that first mill still remain to the east of the existing mill, which was built in 1840.

“Vanderbuilt’s Folly,” the historic South Penn Railroad, was to be aligned directly across the Burnt Cabins Grist Mill site. The railroad grade was completed to the west side of the Little Aughwick, but the stream culvert was never constructed, nor was the grade constructed at the mill site. This railroad right-of-way was purchased and partially used by the Pennsylvania Turnpike Commission, which opened “America’s. First Superhighway” in 1940.

The new turnpike alignment bisected the grist mill site, isolating the mill pond from the mill, except for a culverted mill race under the raised highway alignment. The final turnpike alignment miraculously spared the mill and most of the village from an earlier

plan to locate an interchange at the mill site. The section of Forbes Road through the mill site was rerouted as Allens Valley Road, a state highway, and cut between the mill race and mountainside to pass under the turnpike.

### **Recent Development**

Today, Burnt Cabins Grist Mill has been identified as a “Heritage Gateway” into Fulton County and the southwestern Pennsylvania region. It is located along Route 522, on a portion of an auto tour route through nine counties in southwestern Pennsylvania called the “Path of Progress” by the federal Southwestern Pennsylvania Heritage Preservation Commission (SPHPC.)

In 1994, SPHPC funded a master plan for the heritage preservation and economic development of Burnt Cabins Grist Mill. Over the twenty five years prior to this master plan study, owners Jack and Sonja Blattenberger had restored the mill and developed a successful gourmet mill products business. However, due to costs of historic reconstruction, many other



**Figure 3 - Eastern Elevation showing Existing Mill Race, Head Wall and Trash Screen.**

parts of the heritage site required attention beyond the capabilities of a single owner.

Simone and Jaffe Incorporated (SJ) developed the master plan which recommended physical and interpretive improvements throughout the site. The recommendations were based on a financial strategy developed by E.L. Crow Inc. of Lafayette Hill, PA. Priority was given to improvements that would increase tourism and the sale of mill products. Improvements identified as high priority included the reconstruction of two historic transportation structures:

- 1. a timber mill race flume; and*
- 2. a timber weigh station canopy and scale bed*

In 1995, the Burnt Cabins Grist Mill was awarded a grant from the USDA Forest Service Rural Development program through its community partner, the Burnt Cabins Civic Association, to design and reconstruct the existing timber flume; and the missing timber weigh station canopy and scale bed. Also in 1995, the Grist Mill was awarded a SPHPC grant for site improvements; a historic structures report for an on-site log cabin; and a site-wide interpretive plan. The Owners are instituting these improvements as part of a coordinated program to increase tourism in Fulton County. The working grist mill will be one of the premier heritage destinations for regional visitors.

### **General Description - Timber Reconstruction**

***Timber Mill Race Flume*** - A 40-foot flume which transports water between an earthen mill race and the waterwheel inside the mill was failing and required replacement. The rehabilitation plan included utilizing traditional timber joinery combined with modern techniques and preservation treatment. Reconstruction is scheduled for the Summer of 1996.

***Timber Weigh Station Canopy / Scale Bed***  
Originally, the weigh station was used to weigh the grain transport wagons for calculating quantities. The new weigh station will serve as a visitor orientation and interpretive feature. The original refurbished scale will be used to weigh visiting groups en masse, as a practical demonstration of historic technology. The canopy will provide shelter for these activities. Reconstruction of the weigh station is scheduled for September, 1996.

The original 12' X 22' weigh station is documented in one early photograph. The new weigh station canopy was designed to match the original scale, roof angles and facade. The new canopy structure will also incorporate mortise and tenon joinery - similar to the timber details in the grist mill. Several simple timber construction techniques were designed to protect the canopy against deterioration of exterior timber, without the use of preservatives.



**Figure 4 - Existing Timber Flume, Pedestrian Bridge, and Trash Screen.**

The existing timber scale bed was designed to be replaced with treated timber.

**1. Timber Mill Race Technical Details**

This water transportation structure was constructed between a concrete headwall of the earthen mill race and the stone mill foundation. The timber flume was originally set into an earthen embankment, almost entirely below grade - except for the tops of the posts and headers, and the side of several bays on the downhill side near the waste gate.

**Original Construction**

The existing timber mill race flume was approximately 40 feet long by 48 inches deep by 48 inches wide on the inside. The flume was framed by a series of rectangle bents which consisted of a sill, two posts, and a header. The bents were traditionally constructed with mortise and tenon joinery and fastened with tapered wooden pins. By Summer of 1995, about half of the original timber bents had been temporarily repaired with pressure treated Yellow Pine.

**Flume Bents** - The new bents were redesigned to be very similar to the original structure. All joinery was designed to allow drainage. All joinery and pre-drilling was specified to be performed prior to preservative treatment to prevent perforation of the protective treatment shell. Shaved white oak timber pegs were specified as bent fasteners. Tops of the headers were sloped to prevent standing water and discourage their use as “balance beams.”



**Figure 5 - Existing Timber Flume Bent Detail.**

**Flume Liner** - The original trunk lining was constructed of tongue and groove boards nailed longitudinally to the insides and bottom of the bents. The existing liner boards had been coated many times with tar to seal the wood and joints.

**Flume Invert** - The flume opening into the mill determined the invert of the flume. The flume invert included a five inch curb which diverts water out through a waste gate to bypass the mill during periods when it is not in operation.

**Concrete Headwall** - The formed concrete headwall includes flared upstream walls and a short section of concrete flume and apron. Most of the existing headwall was in good condition, except for the uphill wingwall which was cracked and heaving.

**Control Gate** - Between the parallel walls of the headwall, a slot was formed to house a wooden control gate which is raised and lowered with vertical screw rod to regulate the amount of water which flows through the flume to the waterwheels.

**Waste Gate** - The waste gate is constructed in the downhill side of the timber flume with openings in the top and bottom of the wall boards in one bay near the concrete headwall. The top opening is an overflow. The bottom opening is controlled with a simple board on a stick which uses water pressure to hold the board against the opening. The gate can be raised and lowered to adjust the flow of wastewater.

**Trash Screens** - The Owners have installed two wooden vertical-slatted trash screens within the existing flume and headwall. These devices catch debris before it enters the mill and require periodic raking to keep the flume open.

**Required Demolition** - The entire timber flume was found to require demolition and replacement. One wing of the concrete headwall was cracked and shifted, and required removal and replacement. The existing overflow spillway was a series of deteriorated stone wall terraces stepping down to an overflow pond, which drains into the tail race. Demolition and reconstruction of these stone walls was incorporated into this project. Two wooden foot bridges over the flume were specified to be removed and reconstructed.



**Figure 6 - Existing Timber Flume, Waste Gate and Stone Spillway.**

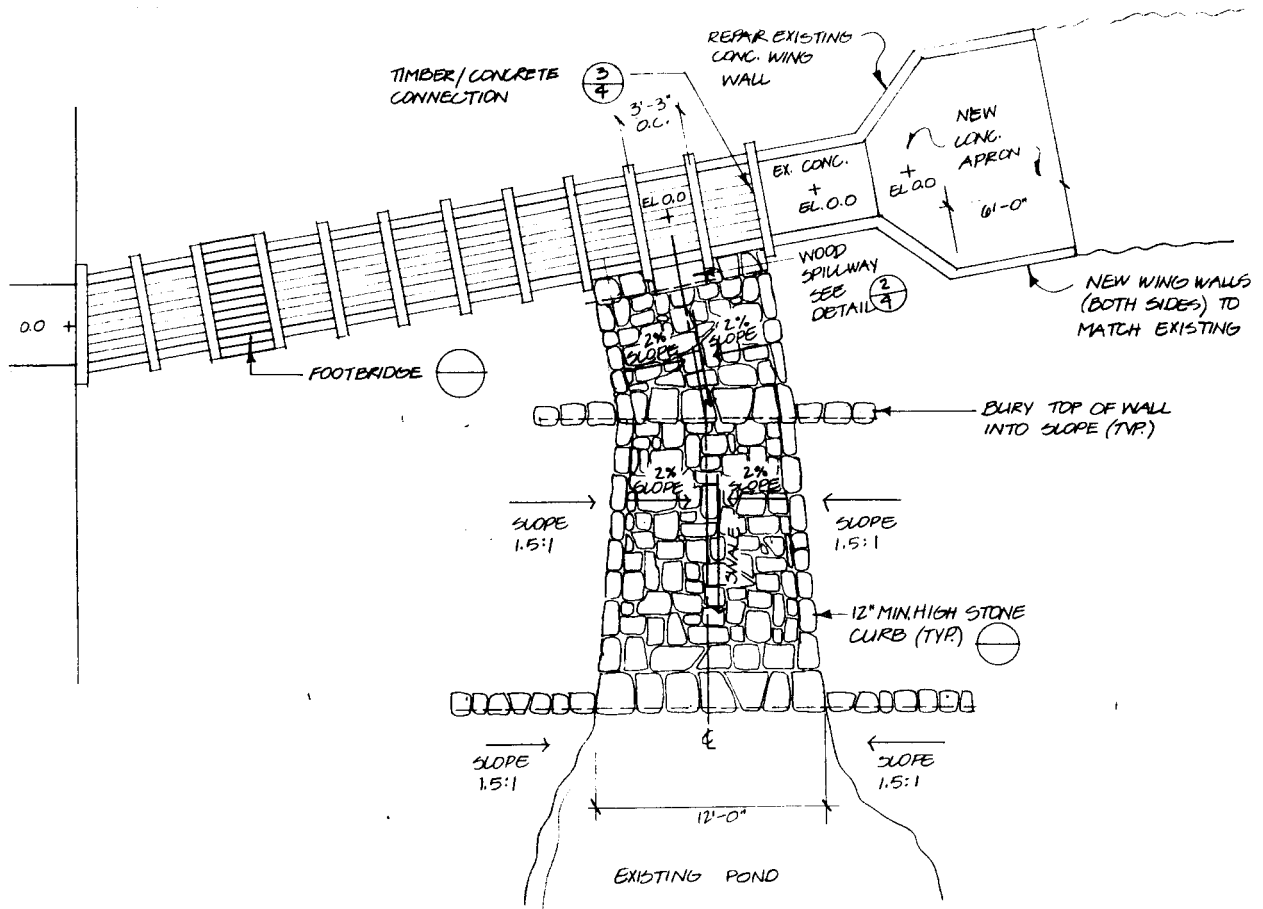


Figure 7 - Plan - New Timber Flume and Spillway

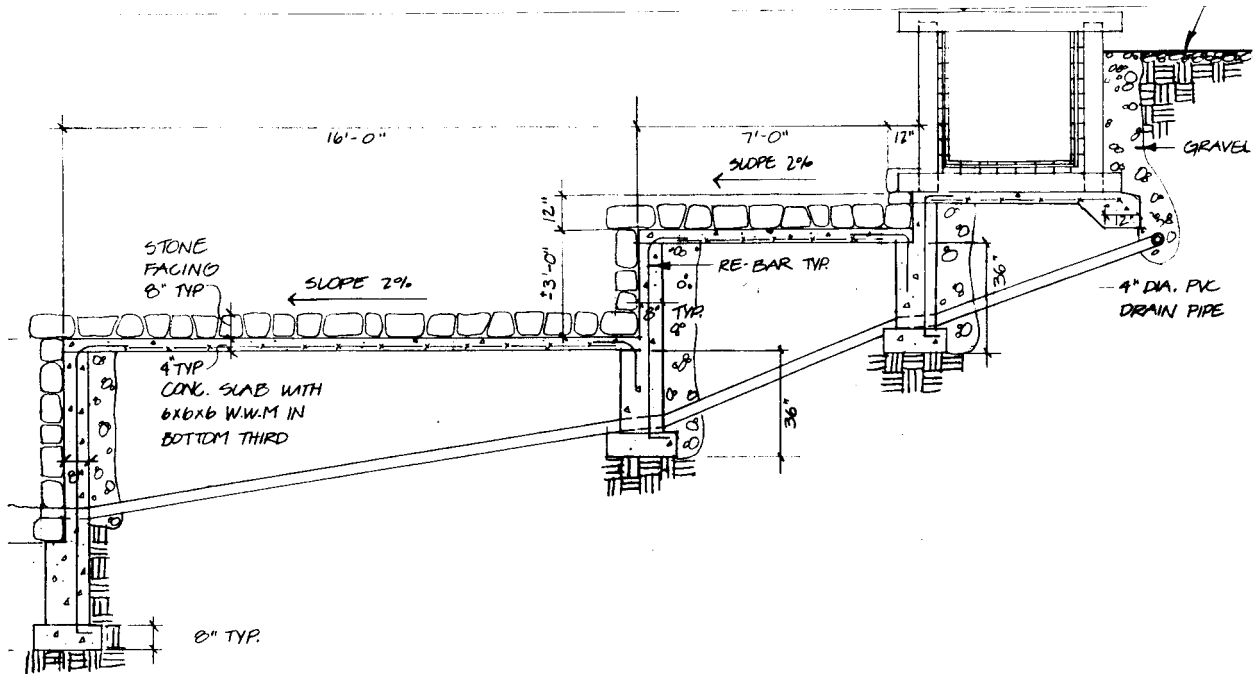


Figure 8 - Section through new Timber Flume and Spillway

**Structural Design Improvements** - A system of structural concrete walls and slabs were designed as the foundation for the new timber flume and spillway. The structure was designed to be hidden below grade and to support an exposed native field stone facade. The design provided for surface and subsurface drainage from the uphill sides of the flume and retaining walls.

New timber bents were designed to sit on a new 4" reinforced concrete slab placed under the flume alignment between the headwall and mill foundation. The bents and structural liner were surrounded by gravel backfill to promote drainage and air movement around the below-grade timbers. A porous geotextile fabric was specified to separate the gravel backfill from the earthen grade.

Two inch thick structural liner boards were designed to be nailed to the insides of the bents in the traditional way, but not to hold water. An impermeable liner was specified to be installed against the inside of the structural flume walls and floor, as one piece, between the mill foundation and the concrete headwall. A "facade" liner was designed as removable sections of longitudinal flooring and siding on sleepers which cover and protect the membrane. The facade wall sections were designed to wedge the floor sections in place without nailing through the membrane below the waterline. In fact, the membrane is employed to prevent leaks, not to protect wooden members. The liner was designed to be sealed to the concrete head wall with battens and to continue inside the mill to line the water distribution box.

**Waterproof Flume Liner** - The waterproof membrane liner was specified as a reinforced, 45 mil polypropylene polymer geomembrane with a non-woven polyester fiber geotextile bonded onto both sides.

#### **Species Selection and Preservative Treatment**

Red Oak was selected for the structural liner and the below-grade bent members because it is a local hardwood which has an open cell structure capable of accepting preservative treatment. Untreated White Oak was specified as the bent headers because the members will be above grade and in contact with the public; and the species has a natural resistance to rot.

CCA-treated Yellow Pine was specified as the facade liner and all control structures. Creosote was chosen

as the optimum timber preservative for the below-grade members. Tar was specified as an on-site joint sealer.

**Hardware** - All hardware was specified to be hot-dipped galvanized.

## **2. Weigh Station Technical Details**

The previous weigh station canopy was a roofed, drive-through structure with portals under both gables. The structure was asymmetrical with an enclosed shed section toward the north.

An existing iron scale carriage is mounted on a formed concrete foundation in a below grade well. The carriage is connected by a lever arm to the scale mechanism which is housed in an existing wooden structure above grade.

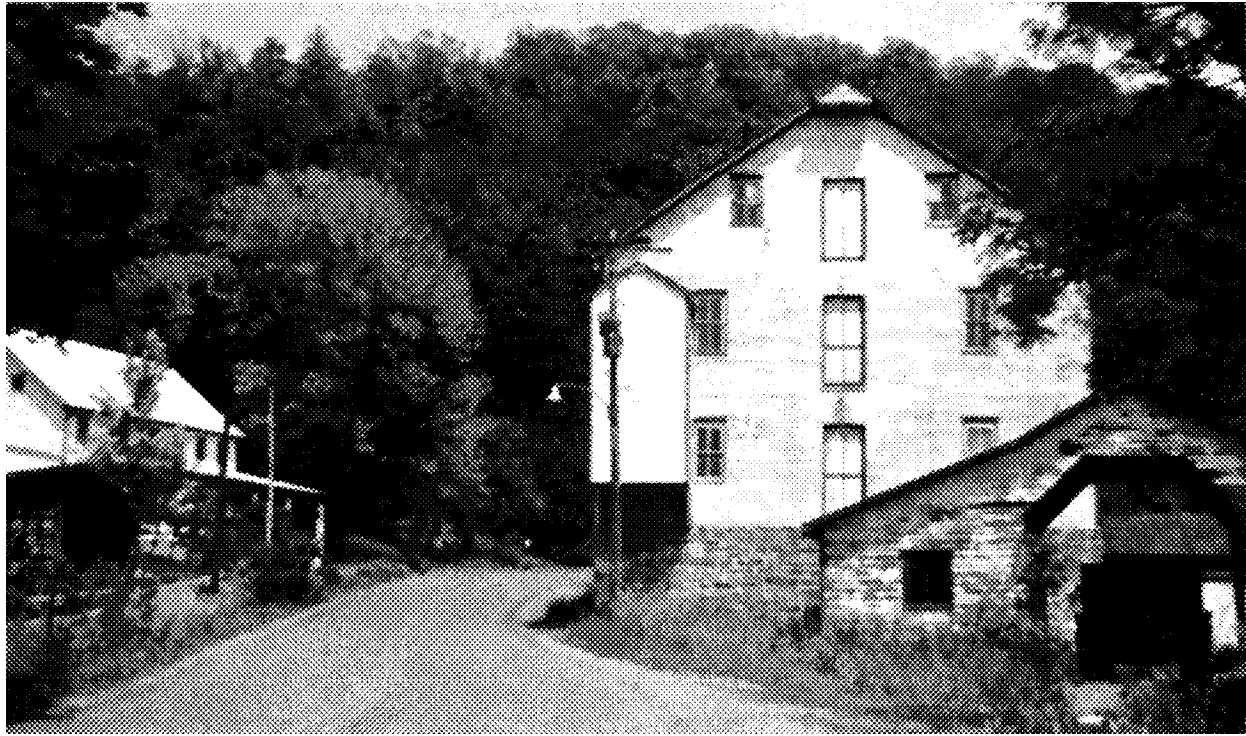
**Original Foundation** - The tops of the concrete well walls are flush with the grade and are approximately twelve inches thick. The original canopy posts were mounted directly into concrete piers located just outside these concrete foundation walls. However, the existing concrete walls were chosen as the foundation for the new structure, to eliminate the need to construct new piers.

**Canopy Structure Type** - The original canopy was used to protect grain wagons. The weigh station canopy was probably "stick" framed, however no evidence exists outside of an original photo. The new canopy was designed to invite visitors, and protect them from the elements during orientation to the mill. It could not exactly replicate the original design.

The new weigh station canopy was designed for observation, as an open-sided timber frame with roof. The design includes mortise and tenon timber joinery, similar to the connections which exist inside the mill and the mill residence.

Horizontal siding was specified on the gable ends to protect roof members and cover knee braces, as siding did on the original structure. Siding exposure matches the mill siding.

**New Post Details** - The posts were designed to bear on standard metal post pedestals, to prevent the end



**Figure 9 - Previous Weigh Station Canopy (date unknown.)**

grain from directly contacting masonry. Posts were designed to be anchored by new threaded anchor rods drilled and grouted into the existing concrete foundation. Posts were designed to be drilled from the bottom to allow the anchor rods to be secured with a typical “bedpost” detail. A mortise opening for the anchor washer and nut was designed into the outside face of the post. All outside faces of posts were designed with a protective one inch vertical sheathing, which extends as a drip edge below the bottom of the posts.

**Bent Construction** - The structure design employs typical “bents” which are post, girt, rafter, and brace assemblies, connected with mortise and tenon joinery and fastened with timber pegs or “pins.” Bents are typically assembled on the ground and lifted to their vertical positions. Connecting girts or “beams” connect the bents. The new canopy design employs four bents - creating three “bays” between the bents.

The bay sizes were determined by the existing concrete foundation which is asymmetrical. A structure of this length could be built with only three bents, however a fourth bent was added to allow the

two center bent rafters to extend as an outrigger roof for protection over the housed scale mechanism.

The bents at both gable ends were designed in the original fashion with knee braces inside the portal openings, and sheathed with horizontal siding. Studs between the bent girts and rafters were framed on two foot centers to carry the siding.

The two interior bents were designed with triangular bracing in the roof trusses between the bent girt and rafters. Standard knee braces below the girts were not used on the interior bents to maintain the sense of one undivided space. The outrigger roof does employ knee braces outside the structure, between the posts and rafters.

**Roof Overhangs** - The roof includes substantial overhangs on the sides and gable ends which are designed to protect the structure and space under the roof from normal, but not occasional driving rains. The side overhang drip lines are two and a half feet from the outside of the posts and we designed to help shade and direct rain and snow away from the posts.

Purlins span longitudinally between rafters, and were designed to mortise into, but sit two inches above the rafter tops to create airspace under the roofing. The



gable end overhangs were designed to use outrigger purlins to extend the drip line of the roof twelve inches beyond the face of the portal.

**Interpretive Features** - The new weigh station itself will be the subject of interpretation for visitors. It will serve visually as a major structure at the entry to the mill from the west. A dated commemorative plaque will be mounted in each gable. The eastern portal will serve as the visitor entry.

A structural railing was designed between bents to control pedestrian movement and to support interpretive display panels. The display panels will be weatherproofed and mounted at an angle against this railing. Lighting inside the structure will be available by running an underground conduit through a channel milled in the outside of one post.

**Self Draining Joinery** - All joints which are not covered by siding or roofing are designed to be self draining. This is accomplished by sloping normally horizontal mortise surfaces, and installing “weep” holes. These typical details are employed in the knee braces and railing joints.

**Species Selection** - White oak was selected as the primary local hardwood species for all canopy structural members because of strength and natural resistance to rot. Siding was designed to be Western Red Cedar.

**Timber Treatment** - The timbers in the weigh station canopy were designed for use without preservative treatment. The plan includes painting the entire structure the same color as the mill.

**Scale Bed** - The existing timber scale bed was rotten and cordoned off from the public. Before demolition, sizes of existing members were documented. The new scale bed was designed using the original member sizes.

The timber bed structure was designed to bear on the three longitudinal steel I-beams of the existing scale carriage, each measuring 12 1/2” deep x 5” wide. Timber transverse beams measuring 6” deep x 8” wide spanned the three carriage beams at 16” centers. Longitudinal sleepers measuring 2” deep x 5” or 4” wide were used to span the transverse beams as nailers for the decking. Three inch thick transverse decking was used at random widths between 7” to 12”.

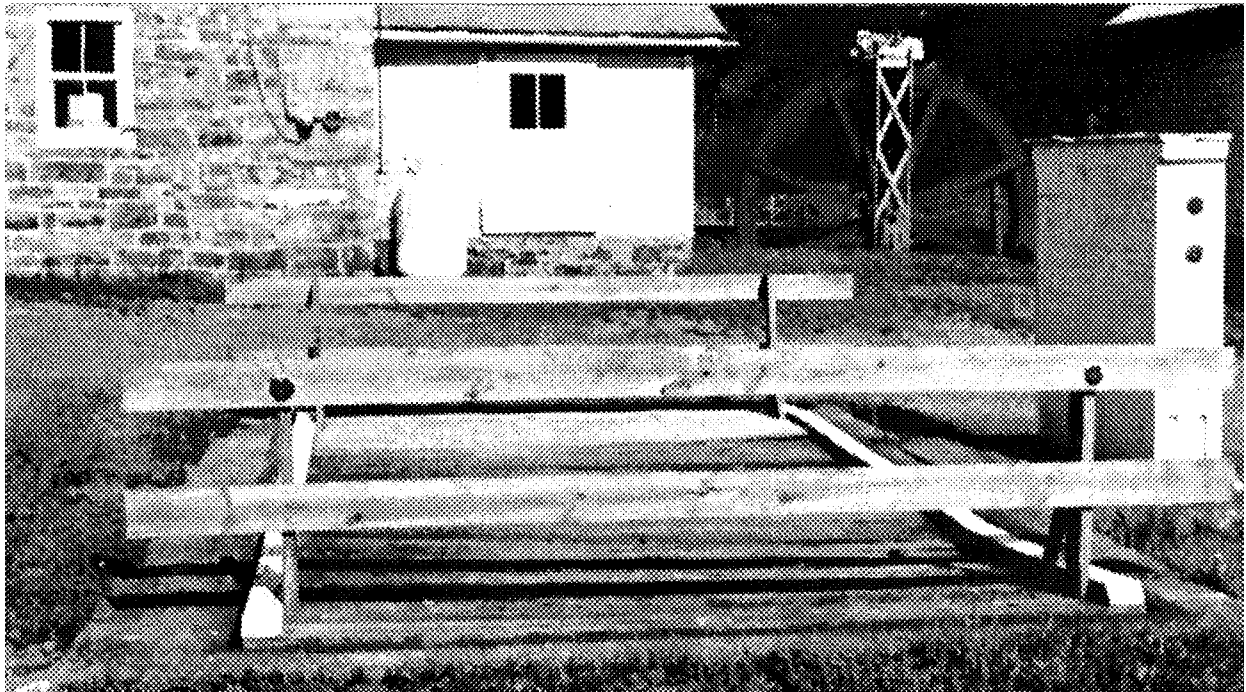


Figure 10 - Existing Scale Bed (view to east.)

The original 1 1/2" space was left between the steel edge on the concrete foundation and the outside edge of the scale bed deck. A 4" x 2 1/4" curbing was designed to fasten to both sides of the deck with 4" hex head lag bolts and washers as in the original deck.

All replacement deck members were specified as creosote treated red oak, except for the deck and curb timbers which were specified as CCA-treated Southern Yellow Pine.

**Scale housing** - The wooden scale housing measures 58" high x 62" long x 12" wide and requires only minor repairs to the southern sill and vertical siding.

Two inch thick decking boards were specified to be replaced between the bed and the scale housing with 2" CCA treated Southern Yellow Pine.

## PROJECT SIGNIFICANCE

The significance of the Burnt Cabins Grist Mill project promotes a wider recognition of "non-bridge" heritage timber transportation structures. The Weigh Station and Timber Flume are part of a comprehensive federal/local rehabilitation plan in a highly visible, historic context.

The projects integrate local timber use, historic timber detailing and craftsmanship, and modern timber treatment.

Information about these heritage recreation structures will be part of a comprehensive interpretive plan for the entire historic visitors' site. The traditional canopy frame raising for the weigh station will be video documented for interpretive displays during mill tours.

## Acknowledgments

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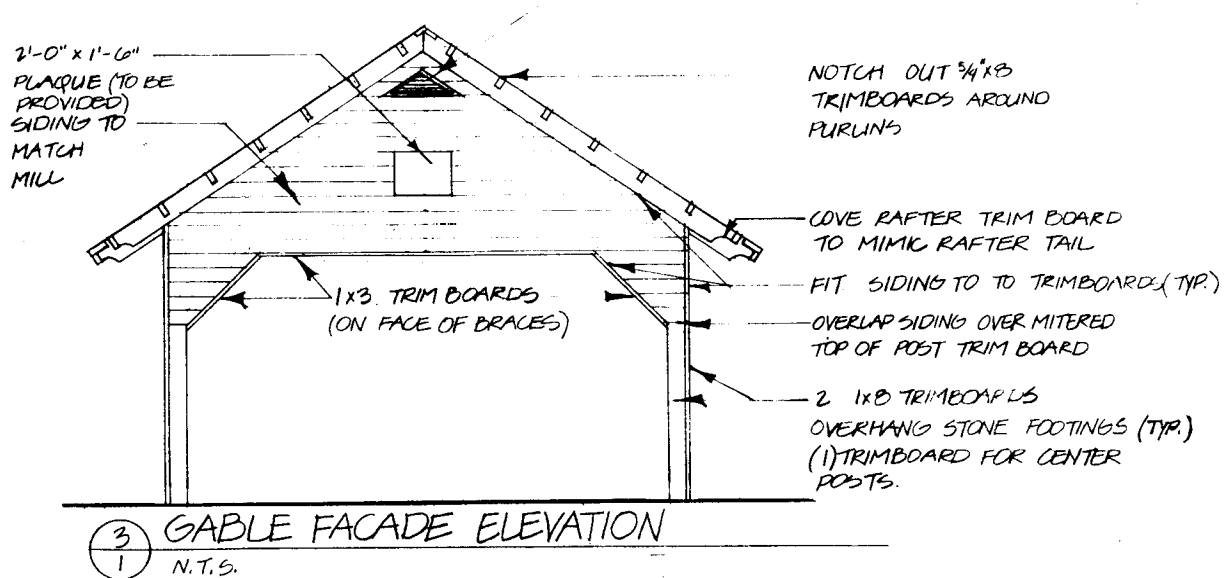


Figure 11 - Gable Elevation of New Weigh Station Canopy.