

MINNESOTA HISTORIC BRIDGE SURVEY-LIST WORKSHEET

Bridge No.: 1816 Type: 301 County: POPE *A = Sig X, Sig Route*

NR CRITERION "A," associated with events in (transportation, other) history:
trunk highway, early _____, later _____ belt/parkway _____ blazed trail
interstate _____ historic/significant crossing in historic district
federal relief program RR grade-separation program _____

NR CRITERION "B," associated with life of person(s) significant in the past:
no ?? yes: _____

NR CRITERION "C," engineering, architecture, aesthetics:
computer-generated "C" list: original list added IN TERRACE MILL HIST. DIST.
notable engineering: design/type: representative / unusual / unique / RR-related
standard plan: documented / looks like / ?? _____
size: # spans / span-length / structure-length / width _____
notable architecture, ornamentation, other aesthetic features: none
style: neoclassical/WPA/moderne/rustic detail: railing/lighting/pier/abutment
material: stone/RC/metal/wood function: rural/urban/gateway/park/beltway/RR
when built bridge was: first / early / common / rare / later / last _____
now bridge is: only / rare / common / ?? _____ in _____
notable: engineer / builder / fabricator / architect _____
meets a registration requirement established for its type: _____

DOCUMENTATION, overall: good some unconfirmed/unreliable nothing
maintenance card Record Center file plans ¹⁹¹⁵ historic photos ¹⁹⁴⁰ Improvement Bull. ¹⁹⁴⁰
known: year-built engineer builder fabricator architect _____

DESIGN INTEGRITY, overall: no serious problems questionable marginal none
altered/damaged/removed/replaced: railings abutments/piers lighting approach
widened: yes ?? moved: yes ??

SURVEY: YES NO CONSIDER ?? 1915/40 - 1915 BRG REPLACED 1940
YES NO CONSIDER ?? HISTORIC DISTRICT

MINNESOTA HISTORIC BRIDGES FIELD SURVEY

County: Pope Township/City: Chippewa Falls Twp Longitudinal Axis: NS - skew

Bridge No./Name: 001816 Carries CSA# 21 Over E Br Chippewa Rn

Bridge Plate(s) and Location(s):

1 Main Span(s) inst. 1st span (over dam?)
 Approach Span(s) 0
 Approach Span(s)

Concrete: Through Arch Deck Arch Through Girder Deck Girder T-Beam Slab
 Rigid Frame Culvert

Steel: Through Girder (Plate) Deck Girder (Plate) Stringer Stringer with outer channels

Other: Armco approach rails - steel square caps + posts chain

If Concrete Arch(es): Barrel or Rib (number of:) Spandrels: Open or Filled If Concrete: Reinforcing bar visible Lower Spalling / Type:

? If Stringer/Girder: Number of stringers / girders: Bridging between stringers: yes (type:) no

Railing: Concrete: Balustrade or Solid Parapet / with recessed panels (number:) Metal: Pipe in concrete posts Angle Sections Channel Sections Lattice Wood Other see above steel curb's (girder edges rise above deck - turn) Flared solid concrete panels at ends: yes no

Abutments: Stone: Straight Wing Walls: T U Concrete: Straight Stub Wing Walls: T U Piles: Steel (I or H) Beams Wood, with back wall of: Wing Walls (if different than back wall) of: Other: fieldstone with retaining - sloped Piers: Stone Concrete: Solid Other: Piles: Wood Steel (I or H) Beams Built-up Steel Cutwaters: Upstream Downstream Other:

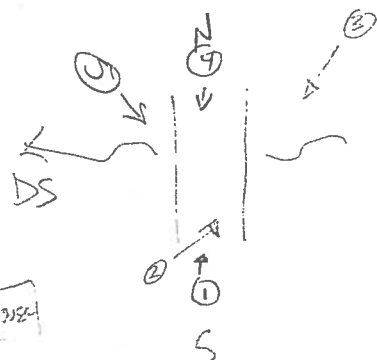
Bearings (Type / Location):

Connections : Bolted Pinned Riveted Welded Other

Esthetics (Ornamentation, Unusual Features):

Slides:
 (6) Log cabin NW of bridge (looking NW)

Sketch Map:



Integrity:

Historic District Potential: (over)

Recorder: CEM Date: 27 Oct Roll / Photo No.: 14/15

HISTORIC STRUCTURE
REPORT
KEYSTONE ARCH BRIDGE
in the
TERRACE MILL HISTORIC DISTRICT

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KEYSTONE ARCH BRIDGE

HISTORIC STRUCTURE REPORT

KEYSTONE ARCH BRIDGE

in the

TERRACE MILL HISTORIC DISTRICT

Constructed 1903

A. FORWARD AND INTRODUCTION

1. Purpose

This Historic Structure Report has been drafted to assist the Terrace Mill Foundation, hereinafter referred to as "The Foundation", in their efforts to restore the Keystone Arch Bridge by assessing the value of the bridge as a historic structure. This report is designed to serve as a reference throughout the project, and an invaluable tool for preserving the rural heritage of the Village of Terrace. This report was prepared by Widseth Smith Nolting and Assoc., Inc, for the Terrace Mill Foundation a non-profit corporation which was founded with the goals of restoring and preserving the Historical Terrace Mill District.

The Terrace Mill District, including the mill building, the keystone arch bridge and other structures, (Photo 1) is listed on the National Register of Historic Places. A copy of the Nomination Form and recognition letter is included at the end of this report. (Appendix A)

2. Preservation Objectives/Statement of Public Benefit

Terrace is a small agricultural unincorporated village (estimated population 90) located 13 miles southeast of Glenwood, Minnesota. (Location Map) Like many similar small towns, it has been continuously struggling to maintain its population, economy, and sense of pride. The Terrace Mill Foundation firmly believes that Terrace's future is largely dependent on the preservation of its past.

a. Economic Benefit. The Foundation is a nonprofit organization. Income received is used to restore and maintain the historic Terrace Mill district and structures thereon. The increased tourism due to the uniqueness of the keystone arch bridge will provide additional income. This additional income will be used to offset maintenance costs of the restored Keystone Arch Bridge.

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b. Community development. The mill and the surrounding property including picnic grounds, are open to the public six days each week from June through the first week in October. Volunteers and CEP workers are trained as tour guides, explaining the history of the area and answering questions. Schools, tour buses, senior citizen groups, and tourists take advantage of this service.

This project is part of an on-going effort preserving and retelling an important part of the early history of Minnesota. The Foundation maintains a curio shop in the mill, selling hand crafted weaving, carvings, pottery, woodenware, and other traditional crafts. Free sales and demonstrations for local crafters are offered twice a year at special events. These special events include Norwegian Rosemaling, wood carving and fiddling.

Terrace Mill Foundation memberships are available for purchase. Family entertainment, for which admission is charged, is available twice each year. Each year the Foundation raffles items including a hand stitched quilt, a rosemaled trunk, and a wood carving and a painting by a local artist. Inside the mill a permanent Mamie Falk collection is displayed. The collection consists of an historic photograph collection and many rosemaled pieces. In 1991 a wooden stairway and viewing platform were constructed northwest of the bridge where the public can enjoy an unobstructed view of the lower side of the Keystone Arch Bridge. These are in addition to the attraction of the flour mill, turbine, keystone arch bridge, heritage cottage and log cabin.

Attendance at the outdoor events ranges from 300 to 1,750 per event, depending on the weather. Drop in visitors that sign the register numbered 1,300 in 1993.

Some other events at the Terrace Mill site have included concerts by the Minnesota Orchestra (3 years), a Guthrie Theater presentation, the St. Cloud Theater, the Butch Thompson trio, the Vagles, a hearing impaired dance group, a symposium on agriculture, a concert by the Concord Singers of New Ulm, and presentations by the local theater group, the Minnewaska Showstoppers.

3. Brief History of the Terrace Mill Foundation

The Terrace Mill Foundation is a non-profit corporation. The Terrace Mill Foundation received non-profit status in 1980 (Exhibit A2). The purpose of the Terrace Mill Foundation is to restore and maintain the Mill and surrounding property. With the restoration of the Terrace Mill Historic District, the early history of this area of rural Minnesota is preserved. The Foundation acquired the property on which the Terrace Mill Historic District is located from Chippewa Falls Township, Pope County, Minnesota, in March 1979.

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B. BRIEF HISTORY OF THE KEYSTONE ARCH BRIDGE

1. Brief History of Terrace.

William Moses and brothers, John and George Wheeler, built the first mill on this site in 1870. In 1878 Moses took over full ownership of the mill by trading his share of the store to George Wheeler. Albert Peterson purchased the mill from Moses in 1883. In 1895 the mill was dismantled and moved to Brooten to be on a railroad line.

Jonas M. Danelz built the present mill and the Keystone Arch Bridge in 1903.

Gustav Anderson purchased the mill and general store in 1910. In 1920 Peter Takken purchased the mill and owned/operated it until 1948. Raymond (Doc) Loader purchased the mill, but after one year returned it to Takken, in 1949. In 1950 Peter and son Art Takken converted the mill to furniture factory, making church furniture. In 1967 the mill was abandoned.

The Glacial Ridge Trail Association assumed ownership of the mill for about one year, in 1974.

In March of 1979, the Terrace Mill Foundation purchased the mill and property from Chippewa Falls Township. In July of 1979, Terrace Mill District was placed on the National Registry of Historic Places. In August, 1979, access to the Keystone arch bridge was purchased by the Terrace Mill Foundation from Pope County.

July 1980, the Keystone arch bridge was deeded to the Terrace Mill Foundation by Pope County. In October the original log cabin (one of the first residences in Terrace) was donated to the Terrace Mill Foundation and reconstructed on the Keystone Arch Bridge access site. (Photo 2)

In April 1982, the Terrace Mill Foundation acquired the adjoining cottage and the Davidson Estate. In May the mill was placed on The National Register of Historic Places. In June of 1982, the adjoining Terrace Cafe lot was acquired with the intent to landscape and construct a large shelter and related facilities.

2. History, Significance and Former Uses of the Keystone Arch Bridge.

The keystone arch bridge was built in 1903 by Jonas M. Danelz who re-established milling operations in Terrace in the same year. The inscriptions "1903" and "JMD" can be read on the stone at the very top of the arch. The bridge originally supported an 18 foot wide roadbed and spans 30 feet across the East Branch of the Chippewa River.

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The bridge, along with the Terrace Mill, was placed on the National Registry of Historic Places in 1979. It was then deeded to the Terrace Mill Foundation by Pope County through right-of-way proceedings in 1980.

The keystone arch bridge is believed to be one of very few remaining in Minnesota.

C. CONSTRUCTION HISTORY

Unfortunately, there is little documentation concerning the construction of the keystone arch bridge. Although the Foundation spent months exhausting leads in search of any existing construction documents, the search was not successful. What little construction information there is can be gathered from photographs and the following letter from Art Takken, former resident of Terrace:

Letter to the Editor
Pope County Tribune

To the Editor:

I enjoyed and appreciated the pictures of Terrace you had in your paper. A while ago you had a picture of the old stone arch bridge showing clearly that the spillway had three-inch bridge planks on it. My dad had them removed, and Torkel Lovik, a brother of Mrs Peter Brandanger, and I hauled in 600 loads of field stones from the local farmer's tone piles, dumped them in the spillway, and dad had them cemented over as they are now. We used our Model T Ford truck, and after dumping them we leveled them off to the slope now there. When I bought the mill building from Dad, Jesse Johnson, my wife's cousins and I rebuilt the super structure. Because there were boiler fluses set in cement, to hold the long planks used at that time, we had to weld the I-beams to them. That is the reason they are not even. Later on because dad filled in a lot of the cement spillway, the pond cannot be lowered enough to work on the flume.

In 1924 a contract was let to Holloran of St. Cloud to rebuild the road through Terrace. Dad gave them the hill if they would go straight through straightening the road and eliminating about 12 sharp turns. Because they wanted to straighten the road by the pond, Dad also gave them permission to put in a 3' x 20' culvert for the race. All of the rest of it, going under ground, is old steel boilers welded together. Just where it enters the mill is an expansion collar. The last pipe at the elbow is a little larger than the other pipe so that wood wedges could be driven in to allow for expansion. Dad and I would climb up the elbow. I have been through the pipe from the mill to the pond several times.

The flour mill is called a "long processed flour mill" and required four floors for that operation. In the late 1920's Dad hired the Thielend Bros. of the Freeport Roller Mills to come and help change the flow of the mill. The flow is the way the wheat is processed through the mill. Dad wanted to improve the flour. The men were Peter and Hubert Thealand, and they did a good job. The folks now call the mill Terrace Mill, but it used to be called Terrace Mills because there were five breaks in a row on the first floor. Each break or mill had two sets of rollers called reductions because they reduced the wheat to the various products. The No. 1 product was called patent flour, the one sold to the store trade for the housewife to use. The No. 2 was called "clear flour" and was sold to a distributor in Minneapolis and was packed in 140 pound jute bags. The third product was called middlings because it came from the wheat between the flour (the middle) and the outside, which was the fourth product and called bran. The middlings or sometimes called shorts sold to the farmers for hog or pig feed. They put it in a barrel, put water on it and called it slop, thus the term called "slopping the pigs". The bran was dry and light and used to feed to cows and is the one they make such a fuss about today. It is fibre and used for Bran Flakes and All-Bran.

Later my dad came up with another product which became quite famous because Dr. Townsend of Brooten recommended it those with ulcers because it was the germ of the wheat, and Dad called it Germ of Wheat and sold it through

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local stores. It became quite popular and is sold by many cereal manufactures today throughout the word but under many names. Dad had orders form all over the country and said he should have bought machines to pasteurize it to keep the bugs from forming. It was rich and the part of the wheat that starts new life that grows.

The last picture of the mill shows they did a wonderful job with the problem we had with the mill all the years we owned it. After the new road was built we were always bothered with silt and gravel washing downs in the front of the mill. When Dad bought the mill and store from G. A. Anderson in 1920, there was a two-foot step up into the mill, but now the road is about level with the floor of the mill. One time the one gear with wood gears set in it was wiped out, and because there was not room for two to carry it up to the first floor, I had to pick it up to carry it myself. When I got it there, Dad asked me to set it on a scale. It weighted 250 pounds, but after that I could not pick it up. I guess it was psychological? Getting it back down was easy as we just slid it on a plank.

If you are interested you may use this as it might help some to better understand the passing of time.....

Sincerely,

Art Takken

Riverside, Cal.

P.S. "My Dad" refers to Peter E. Takken. We came to Terrace in October 1920 at which time I was in my first year in high school. (Exhibit A3)

An early photo of the bridge is contained in Appendix B of this report. (Photo 3) This photo may yield information as to the construction of the arch itself. In particular, the photo chronicles the construction of the stone buttress on the south end of the arch which must have occurred shortly after construction in 1903. Photo 4 shows the keystone arch bridge was constructed downstream on an existing bridge over the spillway. Remnants of the original road surface can be seen in the photo.

Since there has been so little alteration to the bridge since it was originally constructed, and since these changes are readily apparent, much information about the construction itself can obtained by examining the current structure, or photos thereof. Additional photos have been attached to this report, both to identify and illustrate some of the unique and special character of the Keystone Arch Bridge. Please refer to appendix B, Photos 3 through 17.

D. ALTERATION AND CHANGES (PHYSICAL EVOLUTION OF THE STRUCTURE)

1. Chronology

Though exact dates are not known in all cases, the following changes have occurred to the bridge and the environs:

- a. Stone buttresses were added shortly after the bridge was built in 1903. It appears the buttresses were required to support the retaining wall along the west side of the bridge.

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- b. A concrete cast in place deck girder bridge was constructed in 1915 between the keystone arch bridge and the dam. The spillway was also reconstructed in 1915. Over 600 Model T truck loads of rock were placed within the spillway and then capped with concrete. The keystone arch bridge was abandoned at that time.

2. Description

- a. Stone Buttresses: Stone buttresses were constructed along the west face of the bridge. Vertical and diagonal timber braces were installed to support the west face. As can be seen in the lower right corner of photo 3, a stone buttress was under construction at the location of the timber support south of the keystone arch bridge. A remnant of a stone buttress remains at the north end of the keystone arch approximately where a timber support was installed. This feature can be seen in several photos.
- b. Cast in Place Concrete Bridge: This bridge was constructed in 1915 and remodeled in 1940 according to the bridge inventory sheet received from the Pope County Highway Department (Exhibit A4). Bridge No. 1816 was originally a concrete cast in place deck girder bridge. The abutments of Bridge No. 1816 are tied into the abutments of the existing spillway. The construction of Bridge No. 1816 placed the roadway back on the original alignment near the crest of the dam. The bridge, road, and dam crest were raised and widened in 1940 by Pope County. The deck girder superstructure was replaced with a simple steel beam span and a cast in place deck slab.

E. ARCHITECTURAL DESCRIPTION AND ASSESSMENT

1. Assessment of the Exterior Features and Site. Widseth Smith Nolting and Assoc., Inc., inspected the structure and site on September 1, 1994. A description of the structure and site are as follows:
 - a. Roadway: The roadway was constructed using material found in the surrounding hills. The surface of the roadway in Photo 2 appears to be gravel. Over the years grass, weeds, and small brush have grown over the surface. Years of neglect and changes in surface drainage have resulted in embankment erosion. As can be seen in Photos 5 and 6 very little of the original approach embankment remains.

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- b. Arch: The walls of the arch above the foundation are field stone constructed in an arch to provide the span over the East Branch of the Chippewa River. The field stones were mortared together. A thin coat of mortar can be seen over the stones at the underside of the arch indicating the arch was constructed on temporary forms (Photo 8). The mortar in the lower 1/3 of the structure has severely deteriorated, in some areas the mortar is completely gone. The mortar above this point has endured the passage of time, but severely deteriorated (Photo 3). It appears the greatest deterioration of mortar exists where freezing and thawing of ice has eroded the mortar material over the years. In addition, turbulent water flow through the spillway has likely accelerated the loss of the mortar. (Photo 7)
- c. Walls: The walls were also constructed with field stone and mortar. A timber railing was placed at the top of the wall. The timber railing was supported by steel pipe placed into the top of the walls. (Photo 3). A larger area of the west stone wall is no longer present. Several of the steel pipe remain in place (Photos 6, 7, 14).
- d. Buttresses: The buttresses were constructed using field stone set without mortar. Smaller stones were used to chink the spaces between the larger stones. The surface layer of stone was set in mortar (Photos 8, 9, 10). The buttresses may have been added later to support the tall un-reinforced stone walls. Tie rods can be observed in the walls. These steel rods may have been added later to help stabilize the walls. Anchorage for these ties in the west wall have been lost due to wall deterioration.
- e. Foundation: The foundation of the arch may have been constructed using timber cribbing. This type of design would be considered a spread footing on soil.
- f. Site: The Keystone Arch Bridge was constructed on the downstream side of dam. (Exhibit A1). Fill material has been placed on both ends of the bridge since construction. The embankment on the south side now is at the bottom of the arch. This embankment appears to have been placed in order to construct the house located immediately southwest of the bridge. (Photo 11) The embankment on the north side of the bridge begins at the toe of the first stone buttress. (Photo 11) This additional fill material was placed during the reconstruction of the road north of the bridge at the time of re-construction of Bridge No. 1816. This information is in a letter from Art Tokken dated May 15, 1979. (Exhibit A5)

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Several trees have grown in the embankment. Photo 16, taken in 1978, shows two trees at the southwest corner of the keystone arch bridge. These trees are no longer present. The growth of trees weakens the embankment. When the trees are up-rooted, large portions of the embankment are lost. The close proximity of the trees to the arch bridge could and do have a detrimental affect to the stability of the bridge. Roots growing between the stones (Photo 17) loosen the mortar and up-rooted trees may detach a portion of the arch.

2. Character Defining Features: Preservation Required

- a. Roadway: The roadway will be restored by removing the in place topsoil, grass, weeds, and brush. Fill material will be replaced. Gravel surfacing will be placed as a wearing surface. The bridge will be used only for pedestrian traffic.
- b. Arch: The arch will be supported from below using false work forms. The stones used in the original construction of the bridge will be recovered from the stream bed. The stones will be replaced and tuck pointed. Drains will be placed behind the stone arch to intercept moisture and reduce the resulting lateral pressure.
- c. Walls: The walls will be restored using recovered stones. It may be required to collect stones from the surrounding areas if not enough stones are salvaged from the immediate site. Scaffolding will be used to reconstruct the walls. Drain tile will be added and the east and west walls tied together for lateral support.
- d. Buttresses: The buttresses will be restored using construction methods similar to the restoration of the walls.
- e. Foundation: It is not anticipated that the foundations will require restoration, although, soil stabilization may be required.
- f. Site: Site restoration will include removal of trees and brush on the embankment and cleaning debris and fallen trees from the river channel. The existing embankments must remain to preserve the integrity of the house and the County Road.

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3. Engineering/Architectural Investigation

In 1994 the Terrace Mill Foundation selected the Widseth Smith Nolting and Assoc. Inc, engineering/architectural firm to investigate the rehabilitation of the keystone arch bridge. Two site visits were made, one in September and one in December. The site visit in September was performed for Pope County with emphasis placed on structural review of the dam and the highway bridge. Many details of the keystone arch bridge were collected during this visit. The December site visit was required to collect additional information relative to the Terrace Mill Historic District and Keystone Arch Bridge.

4. Material deterioration, etc.

1. The Keystone arch indicates differential settlement in some areas. Evidence of the settlement includes cracking and displacement of joints. (Photo 12) Other issues include the deterioration of the mortar (Photo 13) and the stabilization of the downstream river bed.
2. The west wall is essentially non-existent. One stone buttress and a short length of the keystone wall arch are all that remain. (Photo 14) Deterioration of the mortar is also a concern.
3. The site has been altered. This alteration has resulted in excessive concentration of runoff at the southwest corner of the arch. The concentrated runoff eroded the embankment from behind the southwest corner of the arch. (Photo 7, 14, 15) The main reasons for the wall deterioration are:
 - 1) Lateral earth load acting against an unreinforced wall (initial and continued).
 - 2) Erosion of soil at the southwest abutment caused by runoff and especially overflow during flood events. The present spillway is not adequate. The river overflows the dam and flows over the road and down the southwest end of the stone bridge. Soil is being washed away from the southwest corner of the bridge. The southwest corner is also settling, as can be seen by cracks in the southwest section of the arch. Control of flood flows is the key point. This recommendation is included in the report to Pope County in regard spillway and highway bridge.

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The following article appeared in the Pope County Tribune on Monday, July 6, 1987. Repairs to the keystone arch bridge have been a concern for many years.

Monday, July 6, 1987
POPE COUNTY TRIBUNE

Landmark Keystone arch bridge needs repairs

The keystone arch bridge in Terrace, which is on the national register of historical places, is badly in need of repair. Members of the Terrace Mill Foundation have begun work to restore the arch, but so far no definite plans have been made for work on the arch.

The keystone arch bridge was built in 1903 by Jonas M. Danelz who re-established milling operations in Terrace in that same year. The inscriptions 1903 and "JMD" can be read on the stone at the very top of the arch. The bridge is 18 feet wide and has a 30-foot span.

The bridge along with the Terrace Mill, was placed on the National Registry of Historic Places in 1979. It was then deeded over to the Terrace Mill Foundation by Pope County through right-of-way in 1980. The county decided to deed the arch bridge to the TMF because it was up against the county bridge making the county liable for any injuries that may have occurred there.

The keystone arch bridge is believed to be one of very few left in Minnesota. Florence Griffin, TMF president said "It would really be a shame if it were lost completely."

The damage to the keystone arch bridge includes cracks developing between the stones, abutments corroding and concrete eroding.

Cost of the repair work need on the bridge is not known at this time, but foundation member expect it to be an enormous figure. According to Mike Howe, a TMF member, "There are only one or two companies in the United States that specialize in this kind of work. We have no idea what the cost will be."

Griffin has contacted the Minnesota Historical Society and is currently working to see if a grant to help pay for the restoration from the society is possible.

The foundation's long-term goal for the restoration of the keystone arch bridge is to clear the area alongside the bridge and river in order to build stairs and a viewing area of the arch. (Exhibit A6)

F. THE PROPOSED PROJECT WORK

Recommendations for Necessary Work Based on Existing Conditions and Preservation Objectives.

1. Adaptive Reuse: Functional Redesign

a. Historic Rehabilitation

The main priority of the Terrace Mill Foundation is to preserve this bridge and the Terrace Mill District as a reminder of the struggle and triumph of the rural farming history of Minnesota. As an educational and cultural opportunity, the restoration of this bridge will be key in the heritage of the area.

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b. Potential Functional Uses

The restored keystone arch bridge will have two identified uses:

Pedestrian traffic will cross over the East Branch of the Chippewa River on the restored keystone arch bridge. Removing pedestrian traffic from the County Road will greatly improve safety to the pedestrians.

The second use for the restored bridge will be cultural. Very few bridges of this type of construction still remain in Minnesota. The construction methods used and the labor required to construct the bridge are unique to keystone arch construction. Visitors to the Terrace Mill Historic District will be able to view first hand the efforts required to live during the early development of Minnesota.

c. Accessibility for the Handicapped

It is recognized that the overlook of the bridge is not accessible to the handicapped. A walkway currently exists downstream of the arch and is used for viewing the structure. This walkway will be reconstructed to achieve total compliance with the American with Disabilities Act. Specifically, the slope, width and landing areas of the walkway will be constructed to meet all ADA requirements.

G. **OUTLINE OF REQUIREMENTS FOR ON-GOING MAINTENANCE, PRESERVATION, PROTECTION, OR CYCLICAL MAINTENANCE; NEEDS OF HISTORIC STRUCTURE**

In order for the keystone arch bridge to be preserved and to establish a "preventative maintenance program", the following is recommended:

1. Building and Ground Director

The Terrace Mill Foundation shall hire, or otherwise identify, a person to provide on-going services in regard to the keystone arch bridge. This person shall be the "owner's representative" throughout the restoration project and be in charge of assembling/maintaining all records of the effort. Further, he/she shall perform:

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2. Periodic Bridge and Wall Inspections:

Inspections are required to monitor the bridge and wall and their component conditions. Inspections and recommended intervals may include, but not be limited to the following:

- a. Arch: yearly
- b. Removal of debris from the spillway and stream bed: yearly
- c. Detailed masonry inspection and report by Architect or Structural Engineer: every three years
- d. Structural evaluation: every five years
- e. High water flow inspection: As required following periods of high flow in the river (spring runoff, heavy rains, etc.)
- f. Coordination with the County Engineer with respect to high water flow inspection.

H. COST ESTIMATES

	LOW	HIGH
ADA (Americans With Disabilities Act) Compliance	\$ 2,000.00	\$ 2,000.00
Keystone Arch Bridge	\$120,000.00	\$145,000.00
Walls	\$ 25,000.00	\$ 50,000.00
Buttresses	\$ 3,000.00	\$ 3,000.00
TOTAL ESTIMATED CONSTRUCTION COST	\$150,000.00	\$200,000.00