

Minnesota Department of Transportation (MnDOT) Local Historic Bridge Report- Abridged

Executive Summary

Bridge Number: R0657

Bridge R0657, built in 1935, carries pedestrian traffic over the Minnesota River near the foot of 8th Avenue in the city of Granite Falls, Yellow Medicine County. The bridge connects the downtown area with the east side of town. The City of Granite Falls owns the bridge. Bridge R0657 is a three-span steel suspension bridge and is significant as a rare example of that bridge type in Minnesota. Furthermore, the bridge was built by the Minneapolis Bridge Company, a significant bridge builder in Minnesota.

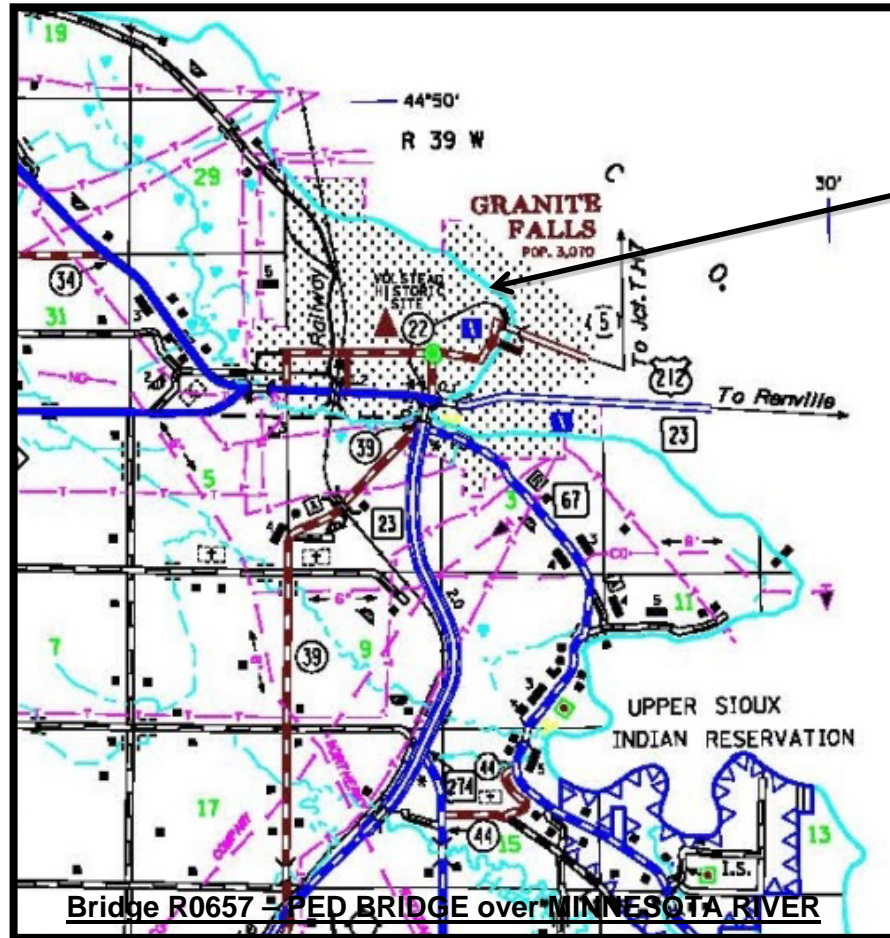
Bridge R0657 will undergo rehabilitation in the fall of 2014. Wiseth Smith Nolting completed plans for rehabilitation for the City of Granite Falls in early 2014. The rehabilitation work will include raising the bridge piers and abutments and adjusting the east suspension tower to maintain an even deck, and raising the bridge low member elevation to reduce potential for damage from a large flood event. To accommodate the new elevation, the east concrete abutment and approach will be rebuilt and an Americans with Disabilities Act (ADA)-compliant pedestrian ramp will be installed.



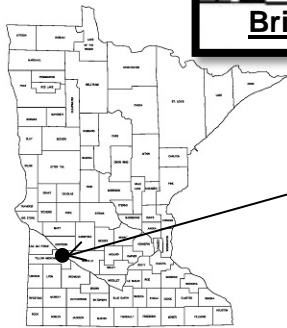
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Bridge Location

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BR. R0657



PROJECT LOCATION

YELLOW MEDICINE COUNTY

NE 1/4, SW 1/4, SEC. 34, TO 116NN, R 39W

UTM ZONE: 15 NAD: 27

USGS QUAD NAME: GRANITE FALLS

EASTING: 982160 ft.

NORTHING: 16289292 ft.

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I – Project Introduction

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This Abridged Bridge Report is a product of a comprehensive study performed for approximately 140 historic bridges owned by county, city, township, private and other state agencies besides MnDOT. The study is the second phase of a multi-phased process developed and executed in partnership with representatives from the Federal Highway Administration (FHWA): State Historic Preservation Office (SHPO); MnDOT State Aid; MnDOT Cultural Resources Unit (CRU); the US Army Corps of Engineers (USACE); local public works and county highway departments; county and township boards and city councils; the preservation community and the general public. To perform the study, MnDOT retained the consultant team of LHB Inc., Mead & Hunt Inc., and The 106 Group.

The general goals of the study include:

- Gathering and compiling the existing historic and bridge condition data and other relevant information on the bridges in the study group into bridge reports.
- National Register nominations for a select number of bridges within the study group which the bridge owner may request a nomination to be prepared.
- Updating MnDOT's *Management Plan for Historic Bridges in Minnesota* based on the study's findings.
- Producing a narrative for the MnDOT Historic Bridge Website to disseminate information regarding locally owned historic bridges in Minnesota.
- Investigating and preparing a summary regarding how other states have funded historic bridge programs and structured Programmatic Agreements when multiple non-state entities are the owners of historic bridges.

The Bridge Reports compile and summarize the historic and engineering information concerning the structures. It is important to note that this report indicates if a bridge is located within a known historic district, but it does not identify all known or potential historic properties. Potential impacts to adjacent or surrounding historic properties, such as archaeological sites or other structures must be considered. Contact MnDOT CRU early in the project planning process in order to identify other potential historic properties. Due to private ownership, recently completed engineering/preservation studies, or recently executed rehabilitation projects, a small number of bridges were identified for abridged reports. An abridged report compiles readily available information, especially data about the bridge's historic significance. Additionally, recent rehabilitation work that has been completed is described and documented with photographs where available. It is important that historic bridges receive appropriate annual maintenance work. This bridge was not assessed for annual maintenance needs however technical guidance on stabilization, preservation and maintenance activities can be found in the *Management Plan for Historic Bridges in Minnesota*, available on MnDOT's website.

Recommendations are not included within the Abridged Bridge Reports. However any future work should be consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties (Standards). The Standards are basic principles created to help preserve the distinct character of a historic property and its site, while allowing for reasonable change to meet new engineering standards and codes. The Standards recommend repairing, rather than replacing deteriorated features whenever possible. The Standards apply to historic properties of all periods, styles, types, materials and sizes and encompass the property's location and surrounding environment.

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The Standards were developed with historic buildings in mind and cannot be easily applied to historic bridges. The Virginia Transportation Research Council (Council) prepared Guidelines, which adapted the Standards to address the special requirements of historic bridges. They were published in the Council's 2001 Final Report: A Management Plan for Historic Bridges in Virginia, *The Secretary's Standards with Regard to Repair, Rehabilitation, and Replacement Situations*, provide useful direction for undertaking historic bridge preservation and are included in the Appendix to this plan.

Existing bridge data sources typically available for Minnesota bridges were gathered for the study. These sources include:

- PONTIS, a bridge management system formerly used by MnDOT to manage its inventory of bridges statewide, and its replacement system, SIMS (Structure Information Management System)
- The current MnDOT Structure Inventory Report and MnDOT Bridge Inspection Report. Reports are available for the majority of the bridges (not available for bridges in private ownership)
- Database and inventory forms resulting from the 2012 Minnesota Local Historic Bridge Study and other prior historic bridge studies as incorporated into the database
- Existing Minnesota historic contexts studies for bridges in Minnesota, including *Reinforced-Concrete Highway Bridges in Minnesota, 1900-1945*, *Minnesota Masonry-Arch Highway Bridges, 1870-1945*, *Iron and Steel Bridges in Minnesota, 1873-1945* and *Minnesota Bridges 1955-1970*
- Field investigations documenting the general structural condition and determining character-defining features

Additional data sources researched and gathered for some of the bridges as available also included:

- Files and records at MnDOT offices
- Original bridge construction plans, rehabilitation plans, and maintenance records of local owners
- Files and documents available at the SHPO office, including previous inventory forms, determinations of eligibility, studies, and compliance documents
- Existing historic and documentary material related to the National Register-eligible bridges

The Appendix contains the following: a Glossary explaining structural and historic preservation terms used in the plan, the Guidelines for Bridge Maintenance and Rehabilitation based on the Secretary of the Interior's Standards, a list of engineering and historic documents available for this bridge, and copies of the MnDOT Structure Inventory and Bridge Inspection Reports current at the time of the report preparation.

The Abridged Bridge Report will provide the bridge owner and other interested parties with detailed information related to the historic nature of the bridge and varied information concerning the condition of the bridge depending on information furnished at the time of report preparation. This information will enable historic bridge owners to make more informed decisions when planning for their historic properties.

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II – Historic Data

Bridge Number: R0657

This narrative is drawn from previous documents, as available for the subject bridge, which may include determination of eligibility (also known as Phase II evaluation), Minnesota Architecture/History Inventory Form, National Register nomination, Multiple Property Documentation Form, and/or applicable historic contexts. See Sources for details on which documents were used in compiling this Historic Data section.

Contractor Minneapolis Bridge Company

Designer/Engineer John A. Roebling's Sons Company

Description

Bridge R0657, built in 1935, carries pedestrian traffic over the Minnesota River near the foot of 8th Avenue in the city of Granite Falls, Yellow Medicine County. The bridge connects the downtown area with the east side of town. The City of Granite Falls owns the bridge. Downtown Granite Falls is located west of the bridge, and a residential area is located east of the bridge.

Bridge R0657 is a 280-foot, three-span, steel suspension bridge. The center span is 130 feet long and the approach spans are 75 feet long each. Two towers are composed of steel I-beam piles and are supported with steel I-beam, angle, and plate bracing. X-bracing runs between the piles. The steel members feature rivets and some replacement bolts. Steel wire main cables and suspender cables run between the towers. Steel I-beam cable anchors connect the vertical cable members to the bridge deck. Angle sections with batten plates form a Warren-with-verticals configuration that functions as the bridge railing. A thin mesh-like metal screen runs along the interior of the truss on both sides of the concrete panel deck.

A bridge plaque is located on the west tower and reads "Roebling Suspension Bridge/ 1935/ City of Granite Falls" along with a list of city officials and "Minneapolis Bridge Co. Builders." The east concrete abutment features flared, sloping wingwalls, and the concrete slab west abutment rests against a concrete block retaining wall. The towers rest on piers consisting of a steel bent supported by an open concrete pier.

Significance

Bridge R0657 was built in 1935 and is significant as a rare example of a suspension bridge in Minnesota. Before its construction, multiple wooden foot bridges at the foot of 8th Avenue connected downtown Granite Falls with the Chicago, Milwaukee & St. Paul Railroad depot on the east side of the Minnesota River. However, ice build-up and flooding in springtime regularly damaged or destroyed the previous bridges.

During the early 1930s the City began planning for a permanent replacement of the existing wooden foot bridge, and in 1934, a local bond fund was established to finance the bridge. The John A. Roebling's Sons Company designed the suspension bridge and provided the steel cables and tower members. The Roebling Company was founded by the sons of the designer of the Brooklyn Bridge, John A. Roebling. By the 1930s the company was the largest manufacturer of steel cable in the world and also provided suspension bridge design services. The Minneapolis Bridge Company was selected in early 1935 as contractor for construction of the pedestrian bridge, and the bridge was completed by that summer.

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The bridge has been largely unaltered since its construction. Alterations to the bridge include some rivet replacement with bolts at an unknown time. The bridge will undergo further alterations during rehabilitation in the fall of 2014. The rehabilitation work will include raising the bridge piers and abutments and adjusting the east suspension tower. To accommodate the new elevation, the east concrete abutment and approach will be rebuilt and an ADA compliant pedestrian ramp installed. The rehabilitation will meet Secretary of the Interior's Standards and maintain the integrity of materials, design, and workmanship. The bridge continues to carry a pedestrian path over the Minnesota River, retaining integrity of location, association, feeling, and setting. The period of significance of the bridge is 1935 corresponding with its date of construction.

The pedestrian bridge meets *Criterion C* as a rare example of a suspension bridge in Minnesota. Furthermore, the bridge was built by Minneapolis Bridge Company, which was a significant bridge builder in Minnesota. Despite being 280 feet, the bridge was not the largest constructed by the Minneapolis Bridge Company, but it is a rare example of a suspension bridge built by this important builder and illustrates the range of bridge types and designs with which they worked.

Historic Context	Historic Iron and Steel Bridges in Minnesota, 1873-1945
National Register Status	Eligible (Individually)
Criterion A Significance	N/A
Criterion C Significance	Engineering: Important Type; Work of a master
Historic District	N/A
SHPO inventory number	YM-GFC-60

Sources Used to Compile Section II -- Historic Data

Summit Envirosolutions. "Pedestrian Bridge." *Minnesota Architectural History Inventory Form*. October 2012.

All current and historic photographs of Bridge R0657 provided by Summit Envirosolutions.

Wideth Smith Nolting. "Construction Plan for Bridge Rehabilitation (R0657)." 2014. Minnesota Department of Transportation.

Barnes, Renee Hutter, Historian, MnDOT Cultural Resources Unit. "Letter to Sarah J. Biemers Regarding SP 098-060-001 [SHPO Number 2012-1740] (Granite Falls Pedestrian Bridge, over the Minnesota River, 90% plans, Granite Falls, Yellow Medicine County)." 23 January 2014. Available at Bridge R0657 file, Minnesota Department of Transportation, St. Paul, Minn.

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Beimers, Sarah J., Manager, Government Programs and Compliance. "Letter to Renee Hutter Barnes Regarding SP 098-060-001 Rehabilitation of the Granite Falls Pedestrian Bridge - 90% design review Granite Falls, Yellow Medicine County SHPO Number: 2012-1740." 20 February 2014. Available at Bridge R0657 file, Minnesota Department of Transportation. St. Paul, Minn.

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II – Historic Data

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Character-Defining Features

Character-defining features are prominent or distinctive aspects, qualities, or characteristics of a historic property that contribute significantly to its physical character. Features may include materials, engineering design, and structural and decorative details. Often, the character-defining features include important historic fabric. However, historic fabric can also be found on other elements of a bridge that have not been noted as character-defining. For this reason, it is important to consider both character-defining features and the bridge's historic fabric when planning any work.

Feature 1: Design and construction of a suspension bridge, including the two steel towers, steel wire main cables, and suspender cables.



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Feature 2: Stiffening truss with riveted steel members in pony Warren-with-verticals configuration.



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III – Bridge Data

Bridge Number: R0657

Date of Construction (remodel) 1935
Common Name (if any) Granite Falls Walking Bridge

Location

Feature Carried: PED
Feature Crossed: Minnesota River
County: Yellow Medicine
Ownership: City of Granite Falls

Structure Data

*Data Current (as of): April 2014
Main Span Type: 323 Steel Suspension
Main Span detail:
Substructure Type - Foundation Type:
Abutment: 1-Concrete – 3-Footing/Pile
Piers: 1-Concrete – 3-Footing/Pile

Approach Roadway Characteristics

Lane Widths: 8 ft Walk
Shoulder Width: N/A (PED)
Shoulders Paved or Unpaved: N/A (PED)
Roadway Surfacing: Concrete

**Number of Crashes reported in MnMCAT within 500 feet of Bridge Site

N/A (PED)

Location of Plans City of Granite Falls
Plans Available 90% Rehab Plans (2013)

* Non-MnDOT data collected during field survey. All other fields of data collected from MnDOT April of 2014. See Appendix C for MnDOT inventory and inspection report data.

** Unless a significant number of crashes are noted on or near a bridge, the accident data is not detailed in this report.

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IV – Work Completed

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Bridge R0657 will undergo rehabilitation in the fall of 2014 to maintain structural integrity. The rehabilitation work will include raising the bridge piers and abutments, adjusting the east suspension tower to maintain an even deck elevation, and reconstruction of the east abutment and approach. An ADA-compliant pedestrian ramp is planned to be installed. Past work on the bridge included replacement of some rivets with bolts at an unknown time. The MnDOT Cultural Resources Unit determined that the rehabilitation will have no adverse effect, in a letter to SHPO dated January 23, 2014. SHPO concurred with this finding in a letter dated February 20, 2014. An electronic copy of the rehabilitation plan is available from MnDOT CRU (see Appendix C for all electronic resources provided to MnDOT CRU as part of this bridge report).

Due to the abridged nature of this report (no field visit to the bridge), no maintenance activities were proposed for this structure as a result of this study. Refer to the *Management Plan for Historic Bridges in Minnesota* for technical guidance on stabilization, preservation and maintenance activities, available on MnDOT's website.

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V – Projected Costs

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Summarized Maintenance, Stabilization, and Preservation Construction Cost Estimates

The cost estimate of rehabilitation of Bridge R0657 is \$1,490,287.30. MnDOT provided the cost estimate and it was not revisited while preparing this report.

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Appendices

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Appendix A. Glossary

Glossary

Abutment – Component of bridge substructure at either end of bridge that transfers load from superstructure to foundation and provides lateral support for the approach roadway embankment.

Appraisal ratings – Five National Bridge Inventory (NBI) appraisal ratings (structural evaluation, deck geometry, under-clearances, waterway adequacy, and approach alignment, as defined below), collectively called appraisal ratings, are used to evaluate a bridge's overall structural condition and load-carrying capacity. The evaluated bridge is compared with a new bridge built to current design standards. Ratings range from a low of 0 (closed bridge) to a high of 9 (superior). Any appraisal item not applicable to a specific bridge is coded N.

Approach alignment – One of five NBI inspection ratings. This rating appraises a bridge's functionality based on the alignment of its approaches. It incorporates a typical motorist's speed reduction because of the horizontal or vertical alignment of the approach.

Character-defining features – Prominent or distinctive aspects, qualities, or characteristics of a historic property that contribute significantly to its physical character. Features may include structural or decorative details and materials.

Condition, fair – A bridge or bridge component of which all primary structural elements are sound, but may have minor deterioration, section loss, cracking, spalling, or scour.

Condition, good – A bridge or bridge component which may have some minor deficiencies, but all primary structural elements are sound.

Condition, poor – A bridge or bridge component that displays advanced section loss, deterioration, cracking, spalling, or scour.

Condition rating – Level of deterioration of bridge components and elements expressed on a numerical scale according to the NBI system. Components include the substructure, superstructure, deck, channel, and culvert. Elements are subsets of components, e.g., piers and abutments are elements of the component substructure. The evaluated bridge is compared with a new bridge built to current design standards. Component ratings range from 0 (failure) to 9 (new) or N for (not applicable); elements are rated on a scale of 1-3, 1-4 or 1-5 (depending on the element type and material). In all cases condition state 1 is the best condition with condition state 3, 4 or 5 being the worst condition. In rating a bridge's condition, MnDOT pairs the NBI system with the newer and more sophisticated Pontis element inspection information, which quantifies bridge elements in different condition states and is the basis for subsequent economic analysis.

Corrosion – The general disintegration of metal through oxidation.

Cutwater – The wedge-shaped end of a bridge pier, designed to divide the current and break up ice.

Decay – Deterioration of wood as a result of fungi feeding on its cell walls.

Delamination – Surface separation of concrete, steel, glue laminated timber plies etc. into layers.

Deck geometry – One of five NBI appraisal ratings. This rating appraises the functionality of a bridge's roadway width and vertical clearance, taking into account the type of roadway, number of lanes, and ADT.

Deficiency – The inadequacy of a bridge in terms of structure, serviceability, and/or function. Structural deficiency is determined through periodic inspections and is reflected in the ratings that are assigned to a bridge. Service deficiency is determined by comparing the facilities a bridge provides for vehicular, bicycle, and pedestrian traffic with those that are desired. Functional deficiency is another term for functionally obsolete (see below). Remedial activities may be needed to address any or all of these deficiencies.

Deficiency rating – A nonnumeric code indicating a bridge's status as structurally deficient (SD) or functionally obsolete (FO). See below for the definitions of SD and FO. The deficiency rating status may be used as a basis for establishing a bridge's eligibility and priority for replacement or rehabilitation.

Design exception – A deviation from federal design and geometric standards that takes into account environmental, scenic, aesthetic, historic, and community factors that may have bearing upon a transportation project. A design exception is used for federally funded projects where federal standards are not met. Approval requires appropriate justification and documentation that concerns for safety, durability, and economy of maintenance have been met.

Design load – The usable live-load capacity that a bridge was designed to carry, expressed in tons according to the AASHTO allowable stress, load factor, or load resistance factor rating methods. An additional code was recently added to assess design load by a rating factor instead of tons. This code is used to determine if a bridge has sufficient strength to accommodate traffic load demands. A bridge that is posted for load restrictions is not adequate to accommodate present or expected legal truck traffic.

Deterioration – Decline in condition of surfaces or structure over a period of time due to chemical or physical degradation.

Efflorescence – A deposit on concrete or brick caused by crystallization of carbonates brought to the surface by moisture in the masonry or concrete.

Extant – Currently or actually existing.

Extrados – The upper or outer surfaces of the voussoirs which compose the arch ring. Often contrasted with intrados.

Footing – The enlarged, lower portion of a substructure which distributes the structure load either to the earth or to supporting piles.

Fracture Critical Members – Tension members or tension components of bending members (including those subject to reversal of stress) whose failure would be expected to result in collapse of the bridge.

Functionally obsolete – The Federal Highway Administration (FHWA) classification of a bridge that does not meet current or projected traffic needs because of inadequate horizontal or vertical clearance, inadequate load-carrying capacity, and/or insufficient opening to accommodate water flow under the bridge. An appraisal rating of 3 or less for deck geometry, underclearance, approach alignment, structural evaluation or waterway adequacy will designate a bridge as functionally obsolete.

Gusset plate – A plate that connects the horizontal and vertical members of a truss structure and holds them in correct position at a joint.

Helicoidal – Arranged in or having the approximate shape of a flattened coil or spiral.

Historic fabric – The material in a bridge that was part of original construction or a subsequent alteration within the historic period of the bridge (i.e., more than 50 years old). Historic fabric is an important part of the character of the historic bridge and the removal, concealment, or alteration of any historic material or distinctive engineering or architectural feature should be avoided if possible. Often, the character-defining features include important historic fabric. However, historic fabric can also be found on other elements of a bridge that have not been noted as character-defining.

Historic bridge – A bridge that is listed in, or eligible for listing in, the National Register of Historic Places.

Historic integrity – The authenticity of a bridge's historic identity, evidenced by the survival and/or restoration of physical characteristics that existed during the bridge's historic period. A bridge may have integrity of location, design, setting, materials, workmanship, feeling, and association.

Inspections – Periodic field assessments and subsequent consideration of the fitness of a structure and the associated approaches and amenities to continue to function safely.

Intrados – The inner or lower surface of an arch. Often contrasted with extrados.

Inventory rating – The load level a bridge can safely carry for an indefinite amount of time expressed in tons or by the rating factor described in design load (see above). Inventory rating values typically correspond to the original design load for a bridge without deterioration.

Keystone – Wedge-shaped stone, or voussoir, at the crown of an arch.

Load Rating – The determination of the live load carrying capacity of a bridge using bridge plans and supplemented by field inspection.

Maintenance – Work of a routine nature to prevent or control the process of deterioration of a bridge.

Minnesota Historical Property Record – A documentary record of an important architectural, engineering, or industrial site, maintained by the Minnesota Historical Society as part of the state's commitment to historic preservation. MHPR typically includes large-format photographs and written history, and may also include historic photographs, drawings, and/or plans. This state-level documentation program is modeled after a federal program known as the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER).

National Bridge Inventory – Bridge inventory and appraisal data collected by the FHWA to fulfill the requirements of the National Bridge Inspection Standards (NBIS). Each state maintains an inventory of its bridges subject to NBIS and sends an annual update to the FHWA.

National Bridge Inspection Standards – Federal requirements for procedures and frequency of inspections, qualifications of personnel, inspection reports, and preparation and maintenance of state bridge inventories. NBIS applies to bridges located on public roads.

National Register of Historic Places – The official inventory of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture, which is maintained by the Secretary of the Interior under the authority of the National Historic Preservation Act of 1966 (as amended).

Non-vehicular traffic – Pedestrians, non-motorized recreational vehicles, and small motorized recreational vehicles moving along a transportation route that does not serve automobiles and trucks. Includes bicycles and snowmobiles.

Operating rating – Maximum permissible load level to which a bridge may be subjected based on a specific truck type, expressed in tons or by the rating factor described in design load (see above).

Pack rust – Rust forming between adjacent steel surfaces in contact which tends to force the surfaces apart due to the increase in steel volume.

Pier – A substructure unit that supports the spans of a multi-span superstructure at an intermediate location between its abutments.

Pointing – The compaction of mortar into the outermost portion of a joint and the troweling of its exposed surface to secure water tightness and/ or desired architectural effect (when replacing deteriorated mortar).

Pony truss – A through bridge with parallel chords and having no top lateral bracing over the deck between the top chords.

Posted load – Legal live-load capacity for a bridge which is associated with the operating rating. A bridge posted for load restrictions is inadequate for legal truck traffic.

Pontis – Computer-based bridge management system to store inventory and inspection data and assist in other bridge data management tasks.

Preservation – Preservation, as used in this report, refers to historic preservation that is consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. Historic preservation means saving from destruction or deterioration old and historic buildings, sites, structures, and objects, and providing for their continued use by means of restoration, rehabilitation, or adaptive reuse. It is the act or process of applying measures to sustain the existing form, integrity, and material of a historic building or structure, and its site and setting. MnDOT's *Bridge Preservation, Improvement and Replacement Guidelines* describe preservation differently, focusing on repairing or delaying the deterioration of a bridge without significantly improving its function and without considerations for its historic integrity.

Preventive maintenance – The planned strategy of cost-effective treatments that preserve a bridge, slow future deterioration, and maintain or improve its functional condition without increasing structural capacity.

Reconstruction – The act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location. Activities should be consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*.

Rehabilitation – The act or process of returning a historic property to a state of utility through repair or alteration which makes possible an efficient contemporary use, while preserving those portions or features of the property that are significant to its historical, architectural, and cultural values. Historic rehabilitation, as used in this report, refers to implementing activities that are consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. As such, rehabilitation retains historic fabric and is different from replacement. MnDOT's *Bridge Preservation, Improvement and Replacement Guidelines* describe rehabilitation and replacement in similar terms.

Restoration – The act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time. Activities should be consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*.

Ring stone – One of the separate stones of an arch that shows on the face of the headwall, or end of the arch. Also known as a voussoir.

Scaling – The gradual distintegration of a concrete surface due to the failure of the cement surface caused by chemical attack or freeze-thaw cycles or rebar too close to the surface and oxidizing from exposure to chlorides.

Scour – Removal of material from a river's bed or bank by flowing water, compromising the strength, stability, and serviceability of a bridge.

Scour critical rating – A measure of a bridge's vulnerability to scour (see above). MnDOT utilizes letter designations to represent specific descriptions of a bridges susceptibility and/ or present condition in regards to scour. Range in condition and scour susceptibility does not necessarily correlate alpha numerically to the MnDOT scour code letters so it is important to understand the specific scour description for each MnDOT scour code. The scour codes and descriptions can be found in the "MNDOT Bridge Inspection Field Manual".

Section loss – Loss of a member's cross sectional area and resulting strength usually by corrosion or decay.

Serviceability – Level of facilities a bridge provides for vehicular, bicycle, and pedestrian traffic, compared with current design standards.

Smart flag – Special Pontis inspection element used to report the condition assessment of a deficiency that cannot be modeled, such as cracks, section loss, and steel fatigue.

Spall – Depression in concrete caused by a separation of a portion of the surface concrete, revealing a fracture parallel with or slightly inclined to the surface.

Spring line – The imaginary horizontal line at which an arch or vault begins to curve. As example, the point of transition from the vertical face of an abutment to the start of arch curvature extending from abutment face.

Stabilization – The act or process of stopping or slowing further deterioration of a bridge by means of making minor repairs until a more permanent repair or rehabilitation can be completed.

Stringcourse – A horizontal band of masonry, generally narrower than other courses and sometimes projecting, that extends across the structure's horizontal face as an architectural accent. Also known as belt course.

Structural evaluation – Condition rating of a bridge designed to carry vehicular loads, expressed as a numeric value and based on the condition of the superstructure and substructure, the inventory load rating, and the ADT.

Structurally deficient – Classification indicating NBI condition rating of 4 or less for any of the following: deck condition, superstructure condition, substructure condition, or culvert condition. A bridge is also classified as structurally deficient if it has an appraisal rating of 2 or less for its structural evaluation or waterway adequacy.. A structurally deficient bridge is restricted to lightweight vehicles; requires immediate rehabilitation to remain open to traffic; or requires maintenance, rehabilitation, or replacement.

Sufficiency rating – Rating of a bridge's structural adequacy and safety for public use, and its serviceability and function, expressed on a numeric scale ranging from a low of 0 to a high of 100. It is a relative measure of a bridge's deterioration, load capacity deficiency, or functional obsolescence. MnDOT may use the rating as a basis for establishing eligibility and priority for replacement or rehabilitation. Typically, bridges which are structurally deficient and have sufficiency ratings between 50 and 80 are eligible for federal rehabilitation funds and those which are structurally deficient with sufficiency ratings of 50 and below are eligible for replacement.

Through truss – A bridge with parallel top and bottom chords and top lateral bracing with the deck generally near the bottom chord.

Under-clearances – One of five NBI appraisal ratings. This rating appraises the suitability of the horizontal and vertical clearances of a grade-separation structure, taking into account whether traffic beneath the structure is one- or two-way.

Variance – A deviation from State Aid Operations Statute Rules that takes into account environmental, scenic, aesthetic, historic, and community factors that may have bearing upon a transportation project. A design variance is used for projects using state aid funds. Approval requires appropriate justification and documentation that concerns for safety, durability and economy of maintenance have been met.

Vehicular traffic – The passage of automobiles and trucks along a transportation route.

Voussoir – One of the separate stones forming an arch ring; also known as a ring stone.

Waterway adequacy – One of five NBI appraisal ratings. This rating appraises a bridge's waterway opening and passage of flow under or through the bridge, frequency of roadway overtopping, and typical duration of an overtopping event.

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Appendices

Bridge Number: R0657

**Appendix B. Guidelines for Bridge Maintenance and
Rehabilitation based on the Secretary of the
Interior's Standards**

The Secretary's Standards with Regard to Repair, Rehabilitation, and Replacement Situations

Adapted from:

Clark, Kenneth M., Grimes, Mathew C., and Ann B. Miller, *Final Report, A Management Plan for Historic Bridges in Virginia*, Virginia Transportation Research Council, 2001.

The Secretary of the Interior's Standards for the Treatment of Historic Properties, first codified in 1979 and revised in 1992, have been interpreted and applied largely to buildings rather than engineering structures. In this document, the differences between buildings and structures are recognized and the language of the Standards has been adapted to the special requirements of historic bridges.

1. Every reasonable effort shall be made to continue an historic bridge in useful transportation service. Primary consideration shall be given to rehabilitation of the bridge on site. Only when this option has been fully exhausted shall other alternatives be explored.
2. The original character-defining qualities or elements of a bridge, its site, and its environment should be respected. The removal, concealment, or alteration of any historic material or distinctive engineering or architectural feature should be avoided.
3. All bridges shall be recognized as products of their own time. Alterations that have no historic basis and that seek to create a false historic appearance shall not be undertaken.
4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
5. Distinctive engineering and stylistic features, finishes, and construction techniques or examples of craftsmanship that characterize an historic property shall be preserved.
6. Deteriorated structural members and architectural features shall be retained and repaired, rather than replaced. Where the severity of deterioration requires replacement of a distinctive element, the new element should match the old in design, texture, and other visual qualities and where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
7. Chemical and physical treatments that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the most environmentally sensitive means possible.

8. Significant archaeological and cultural resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
9. New additions, exterior alterations, structural reinforcements, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

**Minnesota Department of Transportation (MnDOT)
Local Historic Bridge Report- Abridged**

Appendices

Bridge Number: R0657

Appendix C. Documents

Additional Electronic Data Bridge R0657

Historic Data

- Research

Local Data

- No data

MnDOT Reports

- Granite Falls Pedestrian Bridge 2-20-14
- SP098-060-001_90% to SHPO_1-23-14

Photos

- Report Photos
- Summit Envirosolutions

Plans

- 0460A0895 000 - 90% Plan Set