

BRIDGE MAINTENANCE MANUAL CHAPTER 1 POLICIES AND PROCEDURES

Minnesota Department of Transportation (MnDOT)
July, 2019

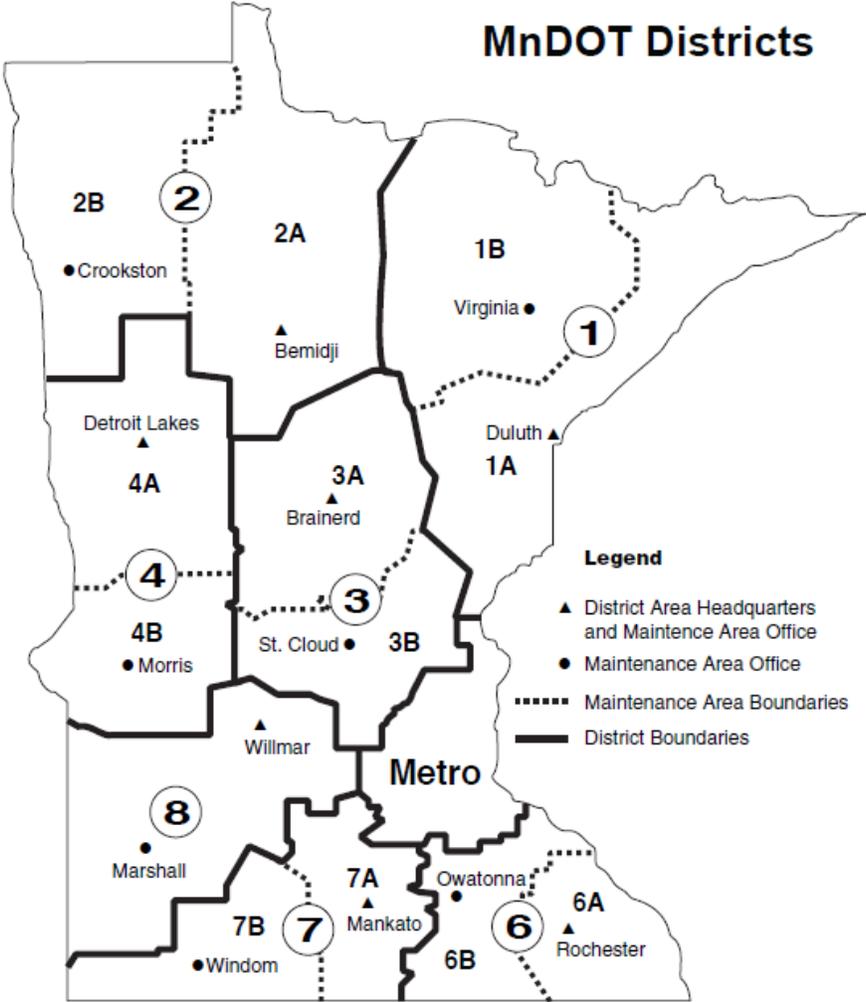


TABLE OF CONTENTS

TABLE OF CONTENTS	2
1.1 OVERVIEW.....	4
1.2 REFERENCES	5
1.2.1 RESOURCES.....	5
1.2.1.1 MnDOT Bridge Resources	5
1.2.1.2 Forms and Manuals	5
1.2.1.3 MnDOT Safety and Environmental Stewardship Resources.....	5
1.2.1.4 Other Resources.....	5
1.2.1.5 Data Collection and Reporting Tools.....	6
1.2.2 BRIDGE INFORMATION.....	6
1.2.2.1 Bridge Inspection and Inventory Reports.....	6
1.2.2.2 Bridge Plans, Shop Drawings, Construction Records.....	6
1.3 DEFINITIONS	7
1.3.1 MAINTENANCE	7
1.3.2 BRIDGE.....	7
1.3.3 MAJOR BRIDGE COMPONENTS	8
1.4 BRIDGE MAINTENANCE RESPONSIBILITIES	8
1.4.1 DISTRICT RESPONSIBILITIES.....	10
1.4.2 BRIDGE OFFICE RESPONSIBILITIES	10
1.4.3 BRIDGE INSPECTION	10
1.4.4 BRIDGE MAINTENANCE AGREEMENTS	11
1.4.4.1 Railroads.....	11
1.4.4.2 Border Bridges	12
1.4.4.3 Local Bridges	12
1.4.4.4 Utilities	13
1.4.5 EMERGENCY WORK	13
1.5 GENERAL TASK REQUIREMENTS	13
1.5.1 TRAFFIC CONTROL	13
1.5.2 PERSONAL SAFETY	14
1.5.2.1 PPE	15
1.5.2.2 Safety Directives	15
1.5.2.3 Lead Hazards.....	15
1.5.2.4 Histoplasmosis.....	16
1.5.2.5 Respirable Silica Exposure	17
1.5.3 PROTECTION OF THE ENVIRONMENT	17
1.5.4 TOOLS AND EQUIPMENT	18
1.5.5 MATERIALS	19
1.6 TRAINING.....	20
1.7 OTHER CONSIDERATIONS	22
1.7.1 LIGHTING.....	22

1.7.2 UTILITIES.....	22
1.7.3 REPAIRS OVER NAVIGABLE WATERWAYS.....	23
1.7.3.1 INFORMATION FOR BRIDGE OWNERS	23
1.7.4 ROADWAY, RAILWAY AND OTHER AREAS	25

1.1 OVERVIEW

The purpose of the MnDOT Bridge Maintenance Manual is to provide information regarding bridge maintenance practices and procedures in accordance with established Department policies.

The most current version of the Bridge Maintenance Manual will be located on the [MnDOT Bridge Construction and Maintenance website](#). To download sections of the most current version of the manual, go to [Bridge Maintenance Manual](#). **It is the user's responsibility to ensure they are using the most current version.**

Maintenance Field Note:

Text in this format symbolizes an important note or tip that is vital to the field work associated with the specific task.

The Bridge Maintenance Manual is divided into three sections: Policies and Procedures, Bridge Asset Management and the Field Guide. The Policies and Procedures Section of the Bridge Maintenance Manual (BMM) is intended to provide detailed guidance of the purpose, requirements, and procedures of the MnDOT Bridge Maintenance Program. The second section discusses the three components of bridge asset management (Assessment, Preservation and Improvement) with an emphasis on increasing public safety and minimizing life cycle costs.

User Note:

Text in this format indicates that another Chapter of the BMM or the BSIPM may contain additional information regarding the topic.

The Field Guide is further divided into sub-chapters: Introduction, Deck, Joints, Superstructure, Substructure, and the Bridge Maintenance Painting Manual, which is intended to provide detailed step by step instructions for key bridge maintenance activities. The Bridge Maintenance Painting Manual provides guidance for maintenance painting of steel bridge structures.

Field notes and user notes are utilized throughout the manual to highlight tips and methods that are important for that specific task or to point the user to a location where additional information may be found.

Information presented in the Field Guide is intended to assist bridge maintenance personnel with performing bridge maintenance activities. However, certain bridge maintenance activities may have specific safety concerns or require consultation with the Agency Bridge Engineer or Regional Bridge Construction Engineer prior to performing the work.



Text in this format indicates that there may be concerns or additional guidance associated with the maintenance task. The Agency Bridge Engineer or Regional Bridge Construction Engineer should be consulted prior to performing these types of repairs.



Text in this format indicates an important note or tip regarding potential safety hazards. Consult the Bridge Maintenance Supervisor or the Agency Bridge Engineer if there are any questions or concerns about safety.

1.2 REFERENCES

The following sections contain bridge references, including links to important resources, manuals and bridge information.

1.2.1 RESOURCES

The following is a list of links to bridge resources. These links are updated periodically. It is the user's responsibility to verify they are using the most current versions of all reference materials contained in this Bridge Maintenance Manual.

1.2.1.1 MnDOT Bridge Resources

- [MnDOT Bridges and Structures External Website](#)
- [MnDOT Bridge Maintenance Supervisors Internal Website](#)
- [MnDOT Bridge Training](#)
- [MnDOT Bridge Office Org Chart](#)
- [Technical Memorandum Guideline for Bridge Preservation, Rehabilitation, & Replacement \(2016-2020\)](#)
- [Bridge Inspection Resources \(technical memos and forms\)](#)
- [Bridge Construction Resources](#)
- [Approved Structural Steel Suppliers](#)
- [State of Minnesota Bridge Inspection Statute](#)
- [State of Minnesota Contracting for Work and Bridge Emergency Statute](#)
- [Approved Products Lists](#)

1.2.1.2 Forms and Manuals

- [Bridge and Structure Inspection Program Manual \(BSIPM\)](#)
- [Bridge Inspection Field Manual](#)
- [Bridge Inspection Reference Manual](#)
- [Bridge Construction Manual](#)
- [Bridge LRFD Manual](#)
- [Minnesota Manual of Uniform Traffic Control Devices](#)
- [MnDOT Manuals](#)
- [MnDOT Forms](#)

1.2.1.3 MnDOT Safety and Environmental Stewardship Resources

- [MnDOT Safety External Website](#)
- [MnDOT Safety Internal Website](#)
- [MnDOT Safety Directives Internal Website](#)
- [MnDOT Environmental Stewardship – Regulated Waste](#)
- [MnDOT Environmental Stewardship – Protected Species](#)
- [MnDOT Environmental Stewardship – Bridge Flushing Guidance](#)

1.2.1.4 Other Resources

- [8th Coast Guard District \(Southern Part of State\)](#)
- [9th Cost Guard District](#)
- [AASHTO Website](#)

- [AASHTO TSP2 Bridge Preservation Partnership Website](#)
- [Midwest Bridge Preservation Partnership Website](#)
- [TSP2 Bridge Preservation Training Resources for Local Agencies](#)

1.2.1.5 Data Collection and Reporting Tools

- [Structure Inventory Management System \(SIMS\)](#)
- [SIMS Tutorials](#)
- [Bridge Management Website \(Bridge Reports\)](#)
- [MnDOT Bridge Maintenance Business Intelligence \(BI\) Reports](#)
- [MnDOT Timesheet Validation](#)

1.2.2 BRIDGE INFORMATION

There are various sources to gather information for bridges in the State of Minnesota that can be very useful for maintenance purposes. The most commonly used sources are listed in the following sections.

1.2.2.1 Bridge Inspection and Inventory Reports

In 2011, MnDOT implemented a new Structure Information Management System (SIMS) for entering bridge inspection and structure inventory data. SIMS is not only a new interface for inspectors to enter inspection data, but also serves as an electronic bridge file for Program Administrators (PA). Within the SIMS program, PAs review and maintain compliance of their bridge inspection program as directed by Minnesota Statute [165.03](#).

The current reports from BrM are available through the [MnDOT Bridge Inventory webpage](#).

To find bridge lists, bridge inspection reports or other bridge information reports, follow these steps:

- Go to the [Bridge Reports Website](#)
- Under Bridge reports, select Bridge inspection and structure inventory reports.
- Select a report category (Bridge Inspection Reports, Bridge Lists, Bridge Maintenance Reports, Bridge Scour Reports, Miscellaneous Reports, Truck Center Reports and Trunk Highway Bridge Logs) to see the list of reports that are available.
- Select a report, enter the desired parameters and view the report.

1.2.2.2 Bridge Plans, Shop Drawings, Construction Records

State highway bridge plans are available on [MnDOT's eDIGS website](#).

City and County plans are on file in local agency offices. Older bridge plans are on microfilm and can be copied on printers available at these locations. Shop drawings or "as built" are not part of the plans but should be available in district or local agency locations.

Proposals are available from the Regional Bridge Construction Engineer until projects are closed out. After a project is closed out, the proposals are then sent to be archived.

Construction records are stored in [eDIGS](#). Various offices maintain partial files for particular areas of concern (Concrete Engineer, Structural Metals Engineer, District Materials Engineer, Bridge Design Engineer, etc.). The Project Engineer's file is available in District Offices for a few years following completion of the work. Construction records are stored at Central Files under the state project number for up to seven years, and then destroyed. Pile driving records and inspection records may be obtained from the Bridge Office files, which are stored at the Records Center.

1.3 DEFINITIONS

The following sections provide detailed definitions for bridge maintenance, bridges and bridge components. It is important that those involved with maintenance are familiar with all aspects and definitions of a structure.

1.3.1 MAINTENANCE

Maintenance is defined as the preservation of all types of roadways, roadsides, structures, and facilities close to their original condition. It consists of performing the services and operations necessary to provide satisfactory and safe highways and structures.

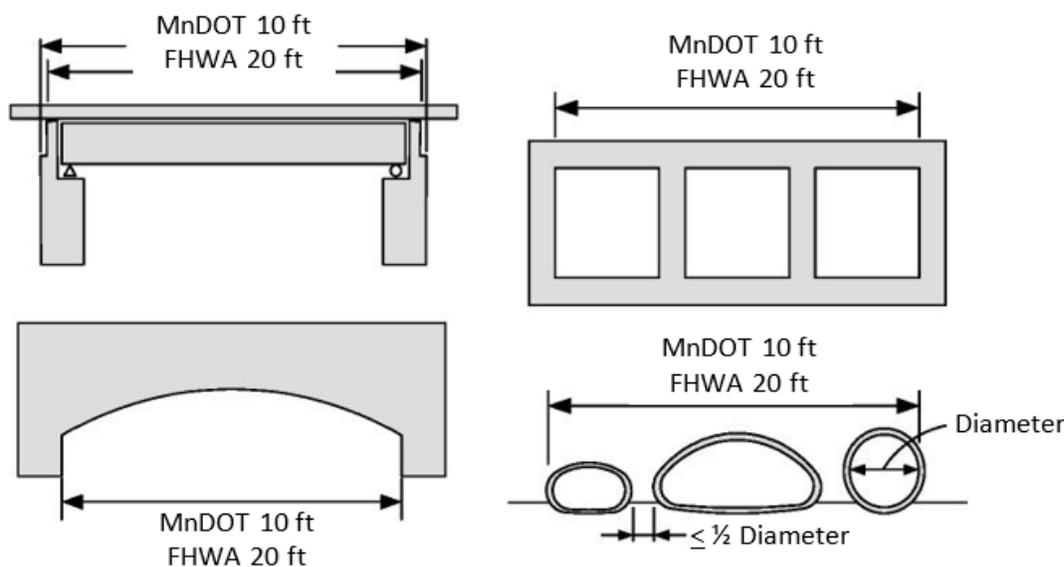
Bridge maintenance can be instrumental in extending service life and delaying the need for more costly rehabilitation efforts. By performing identified maintenance in a timely manner, user costs and service interruptions can be minimized. Bridge maintenance requires special skills in welding, carpentry, and in the use of concrete, epoxies, timber, steel and many other materials.

1.3.2 BRIDGE

According to MN Statute 165.01, Subdivision. 3:

Bridge is defined as “a structure, including supports erected over a depression or an obstruction, such as water, a highway, or a railway, having a track or passageway for carrying traffic or other moving loads, and having an opening measured horizontally along the center of the roadway of ten feet or more between undercopings of abutments, between the spring line of arches, or between the extreme ends of openings for multiple boxes. Bridge also includes multiple pipes where the clear distance between openings is less than one-half of the smaller contiguous opening. This definition of a bridge includes only those railroad and pedestrian bridges over a public highway or street.”

The Federal Highway Administration (FHWA) requires inspection ratings and reporting for structures that are 20 feet or more in length. MnDOT's policy requires inspection for bridges 10 feet or more in length. Refer to the following figure for representations of structure lengths for various bridge types.

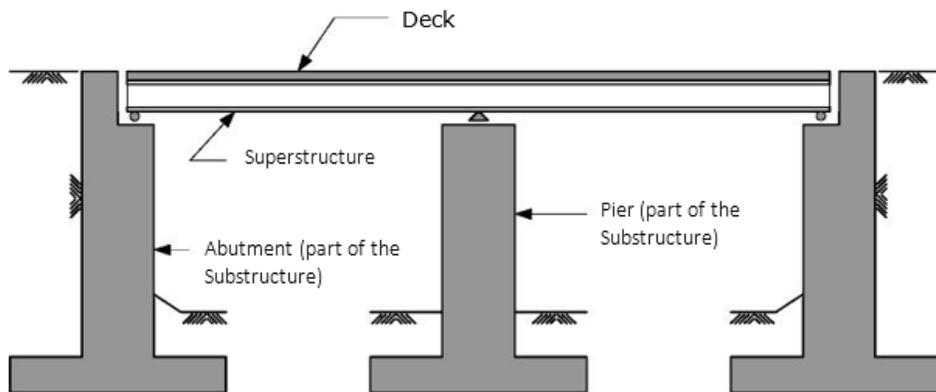


Bridges are classified both with respect to the type of service performed by the bridge and to the structural makeup of the bridge. Refer to the [MnDOT Bridge and Structure Inspection Program Manual \(BSIPM\)](#) Recording and Coding Guide for more information.

1.3.3 MAJOR BRIDGE COMPONENTS

It is important for bridge maintenance personnel to identify and understand the function of the major bridge components and their elements. Most bridges can be divided into three basic parts or components (see figure below):

- Deck
- Superstructure
- Substructure



The **deck** provides a riding surface for traffic utilizing the bridge, but also functions to transfer the dead and live loads to the other bridge components.

The **superstructure** supports the deck and transmits the loads from the deck across the span to the bridge supports. The superstructure typically consists of two basic elements: the floor system and the main supporting elements.

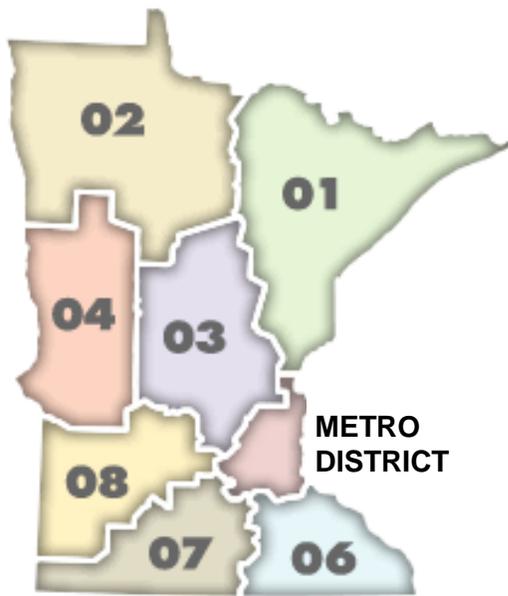
The **substructure** includes all of the elements that support the superstructure: abutments, piers, and bents. These substructure elements transmit the loads from the superstructure to the foundation soil or rock.

Refer to the FHWA Bridge Inspector's Reference Manual (BIRM), found on the [MnDOT Bridge Inspection website](#), for more detailed information regarding bridge components, member shapes, connections, bearings, culverts, and bridge mechanics.

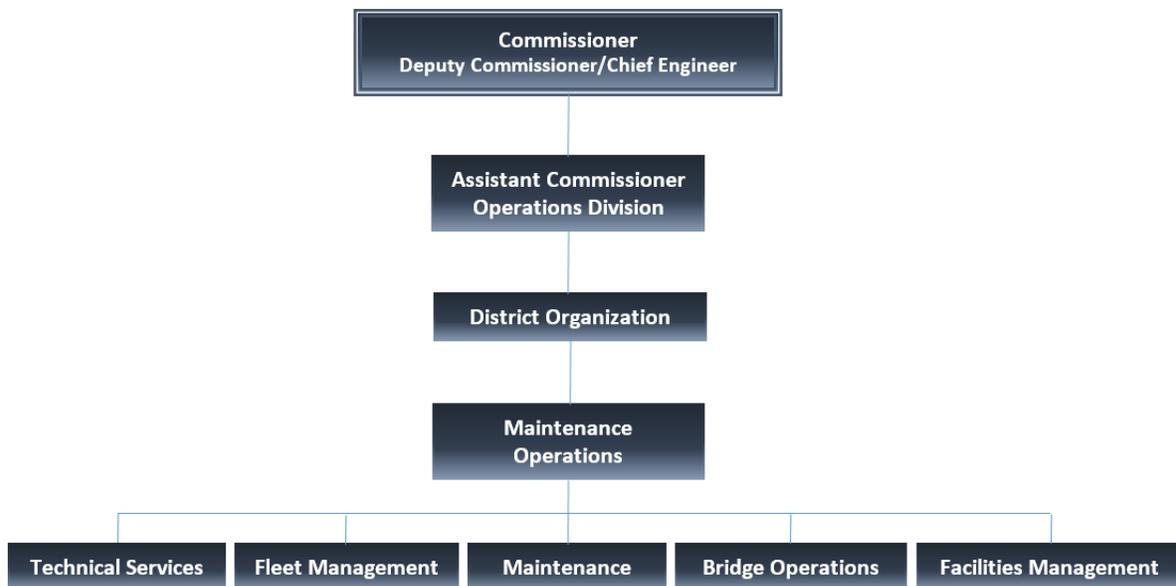
1.4 BRIDGE MAINTENANCE RESPONSIBILITIES

The state is divided into eight Districts, and each District is managed by a District Engineer. District organizations are assigned the responsibility for inspecting and maintaining their bridge inventory. The Bridge Office provides guidance and technical support to the Districts.

Most of the Districts are subdivided into bridge maintenance areas whose functions are administered by an Area Maintenance Engineer or District Bridge Engineer. The following map depicts the current District boundaries.



The organization of the MnDOT Maintenance program is shown below:



1.4.1 DISTRICT RESPONSIBILITIES

District Bridge Maintenance Supervisors typically report to a Bridge Maintenance Superintendent or a District Bridge Engineer who provide guidance regarding structure inspection and maintenance.

Typical functions of the District Bridge Maintenance Unit include:

- Performing routine bridge inspections.
- Performing regular maintenance assessments to identify any deterioration, safety concerns, maintenance needs or external vehicle or equipment damage.
- Prioritizing and scheduling maintenance activities based on inspection and assessment findings.
- Performing Preventive Maintenance activities.
- Maintaining all Trunk Highway bridges within their area.
- Assisting the Maintenance Operations Unit during emergency conditions.
- Assisting with structural repairs to other assets, such as MnDOT facilities, retaining walls, sound walls, large culverts, concrete road panels, etc. when required.
- Inspecting overhead signs, semaphore and highway lighting pole structures.

1.4.2 BRIDGE OFFICE RESPONSIBILITIES

Although the responsibility for routine bridge inspection and maintenance is assigned to the District, the Bridge Office is responsible for providing guidance, training and technical support. Specific functions include:

- Providing direction and technical assistance for fracture critical and other special inspections.
- Administering the statewide Bridge Inspection and Maintenance Program.
- Providing load capacity analysis and load posting recommendations.
- Reviewing special load permit requests.
- Reviewing and providing recommendations for bridge maintenance and construction projects.
- Providing technical assistance and structure plans for special bridge and structure concerns.
- Providing training programs for bridge inspection, maintenance and construction.
- Maintaining and updating bridge specifications, manuals, and memos.
- Evaluating bridge construction and maintenance materials and best practices.
- Developing and maintaining a computerized Bridge Management System for bridge inspections, inventory, and maintenance.

The organizational chart for the Bridge Office can be found in the [BSIPM](#).

1.4.3 BRIDGE INSPECTION

Bridge inspections must be completed in accordance with State and Federal Law. Typically, all bridges on or over trunk highways are the responsibility of the applicable District or their designated authority.

User Note:

For information regarding inspection requirements, frequency, responsibilities, reporting, qualifications, or questions regarding the program please refer to the [BSIPM](#).

The primary goals of a bridge inspection program are to ensure the safety of the structure for highway users and to identify and correct problems at an early stage to reduce the need for major capital investments. In conjunction with the bridge inspection process, a bridge assessment is performed (see Chapter 2) and used by the inspector to document deficiencies and identify required maintenance.

Note:

The bridge supervisor should review all of the bridge inspection reports to assist in determining maintenance needs.

Areas of concern identified through the inspection and assessment process will vary somewhat with the type of structure. Refer to MnDOT's Bridge and Structure Inspection Program Manual (BSIPM), the AASHTO Manual for Bridge Evaluation, the Bridge Inspector's Reference Manual, and the MnDOT Bridge Inspection Manual for more information on inspection requirements for various types of structures.

1.4.4 BRIDGE MAINTENANCE AGREEMENTS

Although most bridges on or over the trunk highway system are owned and maintained by MnDOT, there are some which are jointly owned and some which are privately owned. Privately owned bridges are maintained by the owner. For bridges owned wholly or jointly by MnDOT, maintenance will be typically performed by District bridge crews except where otherwise provided for under written agreement. Bridge maintenance agreements are commonly found for:

- Railroad underpass or overpass,
- Bridges over rivers at State lines,
- Bridges located in a segment of trunk highway where road maintenance is performed under agreement with a local government agency,
- Bridges added to the interstate system subsequent to initial construction,
- Non-interstate bridges with lighting systems within the limits of a municipality, and
- Pedestrian and/or recreation/trail bridges and overhead utility crossing structures.

1.4.4.1 Railroads

Construction of bridges carrying a railroad over a highway or highway over a railroad requires an agreement between the railroad and MnDOT. In a few cases the document may be a limited use permit rather than an agreement. Provisions for maintenance of the structure are normally included in the construction agreement. These agreements are prepared by the Office of Freight, Rail, & Waterways. Railroad agreements may be obtained from the Record Center on request by supplying the following information: Bridge number, Trunk Highway number, approximate location of bridge with respect to nearest town, and name of the railroad. For these records, contact the [MnDOT Rail Office](#).

It is not uncommon for agreements to provide for railroad maintenance or cost participation in maintenance of certain portions of a highway over railroad structure. If maintenance work or cost sharing by the railroad is desired, adequate notice (agreements usually require written notice) is required. Where work required is substantial and cost sharing is desired, it is suggested that District Offices notify railroads one year in advance. Where emergency work is necessary, the local railroad representative should be notified by telephone followed by written notice to their main office.

Note:

Annual railroad training is required if work is performed on railroad Right-of-Way.

Bridges carrying railroad traffic over a state highway are usually owned by the railroad; however, in a substantial number of cases, agreements for these bridges provide for reimbursement of structural maintenance costs by MnDOT. These agreements usually contain a clause allowing MnDOT to paint the bridge, although all other maintenance will be performed by the railroad. MnDOT has chosen to paint railroad bridges with this provision in order to reduce future obligation to reimburse costs for repair of structural steel. Unless the provisions for maintenance are known, agreements should be checked prior to beginning work on railroad overpass or underpass structures.

1.4.4.2 Border Bridges

Minnesota jointly owns bridges which span state boundary rivers with the adjoining states of Wisconsin, South Dakota, North Dakota, and with the Province of Ontario, Canada. Agreements for repair and maintenance are in place for all of these jointly owned bridges. These agreements cover both contract work and work by state forces but may not, in some cases, provide for snowplowing, centerline striping, sweeping, etc. which are normally handled by verbal agreement between District Offices. Agreements allow for cost sharing (normally shared equally) with the requirement that work be approved in advance by both parties. These agreements are prepared by the Bridge Office and are on file in the Bridge and District Offices.

1.4.4.3 Local Bridges

Road maintenance agreements with counties or municipalities are common in larger urban areas. These agreements do not usually include structural maintenance of bridges but may provide for temporary deck patching. Where road maintenance is performed under an agreement with a county or municipality, it is desirable to check for provisions relating to bridge maintenance. These agreements are prepared by the Office of Maintenance and are on file in that office and in District Offices.

Grade separation structures built during the initial construction of the interstate system are normally owned and maintained by MnDOT (except for railroad bridges); however, bridges added to the system subsequently at the request of counties or municipalities may be jointly owned and/or maintained. Maintenance provisions are normally found in the construction agreement prepared by the Municipal Agreements Unit, Office of Design Services and are on file in that unit and in District Offices.

Many bridges in municipalities have roadway lighting systems. For non-interstate system bridges, most lighting systems were installed by agreement with the municipality, and the agreement contains provisions for maintenance of the system. One common arrangement is for the municipality to pay for electric power while MnDOT provides all other maintenance. In some cases, the municipality may be responsible for all routine maintenance of the lighting system. Maintenance provisions are usually found in construction agreements prepared by the Municipal Agreements Unit and are on file in that unit and in District Offices.

Pedestrian and/or recreation trail bridges (including "skywalk" system) may or may not have been constructed by MnDOT but, in either case, maintenance is very often a local government agency or private corporation responsibility. However, MnDOT is responsible for maintenance of the bridges that the department owns on two 'trail' corridors. There are no statutes saying MnDOT must inspect these bridges but they should be monitored per [Minnesota Statute 222.63 Subd. 2c](#). Provisions for maintenance of these non-state trail structures are found in construction agreements prepared by the Municipal Agreements Unit or, frequently, in Utility Permits prepared by the Utilities Section, Office of Right of Way.

1.4.4.4 Utilities

Overhead or underground utility crossing structures (pipelines, utility tunnels, etc.) are usually built and maintained by private corporations as specified in a Utility Permit. Various utilities may also be attached to MnDOT bridges and tunnels by agreement or permit. Utility permits are on file in the Utilities Section and in Maintenance Area offices.

1.4.5 EMERGENCY WORK

When a disaster requires closure of a bridge and the district cannot repair the damages and restore traffic within a reasonable time using its own equipment, materials and forces, the Office of Maintenance will, at the request of the District Engineer, prepare an emergency order in accordance with [Minnesota Statute 161.32, Subd. 3](#) for consideration by the Assistant Commissioner of Operations and the Deputy Commissioner. With an approved emergency order, contracts may be let, equipment rented and materials purchased without the delay associated with taking competitive bids.

1.5 GENERAL TASK REQUIREMENTS

The following are general requirements that should be considered when performing bridge maintenance tasks. However, refer to the Field Guide for details related to each specific task.

1.5.1 TRAFFIC CONTROL

All bridge repair work requires consideration of traffic management in order to protect the driving public and the crews working on the bridge. Depending on the work activity, it may be more cost effective to have highway maintenance crews assist bridge crews with traffic control.

When planning bridge repair work in congested areas, contact the District Traffic Engineer to determine the type of traffic control that will be necessary. Contact the District Traffic Engineer well in advance of the work to plan and communicate traffic changes, especially on heavily traveled routes.

Where traffic needs to be restricted, a minimum width of 10 feet is required for each traffic lane open to traffic. If the work cannot be properly performed with traffic on the structure, request complete closure of the bridge.

Plan and set traffic control in accordance with the standards contained in the most current edition of the [Minnesota Manual on Uniform Traffic Control Devices \(MUTCD\) and Field Manual](#) and the [Minnesota Traffic Control Field Manual](#).

The appropriate message for advance signs should be "Bridge Work Ahead". If this sign is not available, crews can use "Road Work Ahead". Where the work area is on a curve or just beyond a horizontal or vertical curve, all advance warning needs to be placed to give adequate warning in advance of the curve or crest.

When traffic restrictions are required, notify the District Permit Office and/or the Central Office Road Condition Information Section two weeks in advance of the proposed work if possible. Some Districts have a Lane Closure Manual that must be used when planning and scheduling lane and/or shoulder closures on MnDOT owned and operated roadways.

Districts may also have specific traffic control resources for planning traffic controls, such as lane closure manuals.

- [Metro Allowable Lane Closure Manual](#)
- [District 6 Lane Closure Manual](#)

Guidance on work zone safety considerations can be found on the [Maintenance Operations website](#) and on the [Traffic Engineering Publications website](#).



1.5.2 PERSONAL SAFETY

All bridge maintenance work shall be done in a manner which protects the workers from bodily harm and in conformance with OSHA regulations and Agency Safety Rules. Additional information on safe work procedures for MnDOT employees can be found in the [MnDOT Safety Handbook](#), Compliance with Lead Regulations, [Guidance For Paint Removal From Bridge Steel Structures Performed By MnDOT Personnel](#) and other Department publications.

Safety is paramount for both the bridge maintenance worker and the traveling public. Follow all required safety protocols when at the job site. If there are questions or concerns regarding safety, contact the Bridge Maintenance Supervisor or the Agency Bridge Engineer and consult the Agency or District Safety Administrator before beginning work. Refer to the Safety Data Sheets (SDS) to determine the required personal protective equipment (PPE).

Rescue planning is another important consideration when preparing for bridge inspection and maintenance operations. Bridge Maintenance Supervisors should consider completing a High Work Plan when performing high work. A High Work Plan is used to identify the hazards associated with the high work and to outline a rescue plan. A [High Work Plan template](#) is available on Bridge Maintenance Supervisor's internal website under the Training tab.

1.5.2.1 PPE

Bridge maintenance employees must wear appropriate PPE at all times when at the job site. PPE typically consists of hand protection (gloves), eye protection (safety glasses, goggles or face shield), visible clothing (HiVis vests, caps and pants where necessary), head protection (hard hat) and foot protection. Other PPE may be required for specific work environments and products used.

1.5.2.2 Safety Directives

General information regarding statewide worker safety can be found in the [MnDOT Employee Safety Handbook](#), which is located on the MnDOT Safety internal website.

All new MnDOT employees shall complete required E-learning and be familiar with guidance provided in the handbook. Current employees are strongly encouraged to periodically review the handbook. District maintenance employees, in coordination with their field supervisors, are encouraged to contact their District Safety Administrator for further information.

Bridge maintenance workers need to be aware of the hazards present when working on bridge decks and working on or near water. Safety Directives for MnDOT employees pertaining to these and other hazards, as well as other safety related resources are available on the [MnDOT Safety and Work Injuries web page](#) and [MnDOT's external Safety web page](#).

1.5.2.3 Lead Hazards

The potential hazards associated with removal of paints containing lead is an important factor in bridge maintenance work. Any work performed that consists of lead removal must meet the Lead Compliance Regulations. Refer to the bullets below for additional guidance to prevent lead exposure.

- Welding and cutting on structural steel prime coated with red lead paint vaporizes the paint when heat is applied. Inhaling of the fumes is a potential danger to the worker. Respiratory protection approved by the U.S. Bureau of Mines (preferably supplied air hoods) should be worn by welders and cutters.
- Spot cleaning involving grinding, wire brushing, scraping or abrasive blasting should be done only when approved respiratory protection is worn.



- Paints containing lead pigment should not be used by departmental personnel.
- The following program should be followed when paints containing lead pigment are removed:
 - a. Protective clothing, coveralls, gloves and neck cloths should be changed whenever they become damaged, torn or saturated with paint dust, as dust from contaminated clothing can be inhaled or ingested.
 - b. Soap and hot water and/or waterless hand cleaners should be readily available at the job. Solvents, gasoline or kerosene should never be used for cleaning hands.
 - c. Hands and faces should be washed and fingernails cleaned prior to smoking and eating. Eating or smoking should not be done unless a worker is 50 feet (100 feet downwind) away from the immediate area being painted.

Additional information regarding MnDOT's lead compliance program for MnDOT employees can be found on the [internal MnDOT Safety Website for Written Programs](#).

1.5.2.4 Histoplasmosis

Staff engaged in bridge maintenance activities (similar to, but not inclusive of, the subjects discussed in this manual) are often required to work in areas where pigeons have nested, usually for long periods. This nesting results in a substantial build-up of pigeon droppings, a condition which can be harmful to humans if the material is disturbed and made airborne.

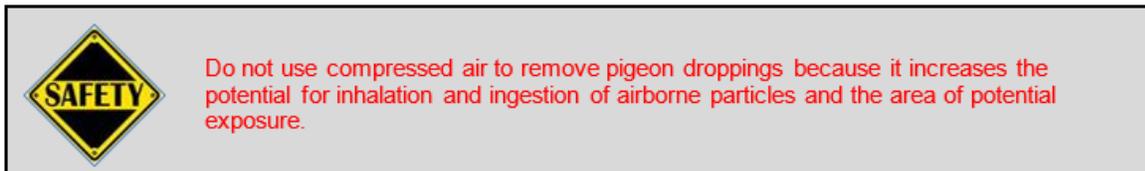
Histoplasmosis is a fungal infection caused by breathing in spores of a fungus (*Histoplasma capsulatum*) often found in bird and bat droppings. Histoplasmosis is most commonly transmitted when these spores become airborne, such as during bridge inspection and maintenance operations. Infectious material enters the body usually by inhalation into the lungs, but in some cases by ingestion through the mouth into the gastrointestinal tract. Pigeons do not carry the organism that causes histoplasmosis. Histoplasmosis is caused by a soil organism that requires the moist, nutrient rich environment that large masses of droppings offer. Areas with small amounts of dried droppings pose minimal hazard.

Procedures

Prior to work in any area where pigeons are likely to nest, a thorough inspection shall be made to determine if, and to what extent there is a build-up of material. Inspection itself requires minimum precautions such as the use of personal protective equipment, which may include gloves, rubber boots, rain suit components, goggles, and a dust/nuisance respirator. Questions regarding proper equipment for this activity should be directed to the Agency or District Safety Administrator.

If substantial material is found in the immediate work area, cleaning must be performed. Staff engaged in cleaning activity shall wear all of the personal protective equipment specified above. A water hose is an effective means to remove material. If attempting to scrape the debris away, it must be kept wet during the entire process. Application of a cleaning agent (bleach, for example), before removal may help dissolve the material, and may be applied as a disinfectant upon the affected surfaces after the droppings have been removed.

Following successful cleaning, the personal protective equipment specified above is no longer required. All other personal protective equipment appropriate for the task and/or location shall be used.



Employees engaged in cleaning, or any other activity which involves exposure to pigeon droppings, should observe a high degree of personal hygiene, even if the exposure is casual. Special care must be taken to wash hands thoroughly before eating or smoking.

1.5.2.5 Respirable Silica Exposure

Tasks that involve potential exposure to respirable crystalline silica include, but may not be limited to, cutting, drilling or sweeping concrete; applying shotcrete; cutting or drilling block and brick; and milling, cutting, overlaying, power sweeping or crack sealing road surfaces in either indoor or outdoor work areas. For more information regarding identifying exposures and implementing appropriate control measures, MnDOT employees should refer to applicable OSHA standards and MnDOT's Respirable Silica Exposure Control Plan, which can be found on the [internal MnDOT Safety Website for Written Programs](#).

1.5.3 PROTECTION OF THE ENVIRONMENT

Public awareness protection of our environment from indiscriminate actions is necessary, and has led to the establishment of comprehensive rules and regulations. Enforcement of the rules and regulations has been given to the Pollution Control Agency and the Department of Natural Resources. Pollution of air, land and water or damage to vegetation or endangering fish or animal life is controlled by these agencies.

Sources of air pollution may include vehicle exhaust, dust, smoke and sprayed paint or other chemicals. Vehicles should be well maintained so that emissions are within acceptable limits. Burning of debris or scrap materials should be carried out in an approved manner and by proper permit where required. Operations should be performed so that a minimum of dust or grit is raised. Sandblasting and spraying of paint or herbicides should be done with care to minimize drift.

Land pollution may include spillage of oil or gasoline or other petroleum products, concrete chips, cement, scrap wood, plastics, salt, chemicals, paint, solvents, rags, pads, scrap iron, etc. Clean up and disposal of these materials should be handled in accordance with the regulations for burning, burying or disposal at licensed disposal sites. Notification of the U.S. Coast Guard (navigable waters only) and MPCA is required for spills which may contaminate water of the State.

Water pollution may include any material foreign to streams or lakes as well as any action which may stir up the bottom materials unnecessarily. Reasonable efforts to prevent pollutants from contamination of the waterway must be taken. Where this is unsuccessful, any floating material such as oils, paints and other debris should be cleaned up. Floating booms should be used, where effective, to collect scum or floating material.

The Department of Natural Resources should be notified prior to performing normal or emergency maintenance work in a body of water, as a permit is usually required.

1.5.4 TOOLS AND EQUIPMENT

Each Bridge Maintenance Supervisor is responsible for the tools and equipment assigned to their crew and must ensure that they are properly inspected, maintained, handled and inventoried.

A running inventory should be retained to document State fixed asset equipment (value over \$5,000) and all 'sensitive' tools (value over \$500). **A fixed asset number may be assigned to any item the District bridge office deems necessary.**

Inspect all tools and equipment before each use to ensure they are in good working condition. Check inventories annually to replace any tools and equipment that are not in good working condition. Annual inventory checks should be combined with full inspections to ensure that proper maintenance procedures are being observed to obtain reasonable service life from the equipment. Any MnDOT equipment that may have been lost, stolen, damaged or recovered should be reported on the form "Stolen, Lost, Damaged, or Recovered Property Report" located on the [MnDOT Forms website](#).

Each District may decide the necessary equipment and tools needed in their geographical areas. Equipment may also be shared across maintenance areas or Districts. The following list includes tool and equipment recommendations from bridge crews statewide.

- Heavy duty tandem axle flatbed truck with a hydraulic boom (10 ton unit). A winch on this unit is also desirable.
- 6 passenger truck with a power tailgate
- 3/4 or 1 ton pickup truck with lift gate
- Tool truck, van body or tool trailer
 - Tool truck should be 1-1/2 to 2 ton truck with 14' van body or a van body converted to slip on a class 33 (or larger) chassis for tool storage. A 14' tool trailer could be used instead of the van body styles.
- Air compressor with minimum 250 C.F.M (may be included in the tool van)
- Skid steer
- Concrete/Rock drill, air driven
- Scabbler
- Steel drill(s): electric, broach or electromagnetic
- Chipping hammers/rivet busters with extensions as needed of various sizes with steel chisel and concrete bits
- Chain saw(s)
- Oxygen and acetylene welding and cutting equipment
- Heavy duty impact wrench, air driven or electric impact
- Manifold jacking systems from 50T to 200T with low profile jacks
- Portable welder (250 amp minimum)
- Power lift/hydraulic platform
- Concrete drum or paddle type mixer
- Power tools: Small drills, power saws, small impact wrenches, drill press, miter saw, band saw, table saw, etc.
- Water tanker with a high volume – low pressure pump and fire nozzle attachment (one per District at a minimum)
- 100 lb. to 600 lb. capacity sandblaster with 150 feet of hose equipped with up to date approved positive air helmet with up to date filtered supply of fresh air
- Each district should have: a 2 horse power Special Surface Finish Airless paint sprayer with the proper gun(s)
- 12" or 14" concrete saw
- Pan tamper
- Vibrating concrete screed
- 14' to 16' boat & oars with motor (5 H.P. minimum/75 lbs. thrust) with approved PFDs
- Aluminum scaffolding of varying lengths to fit the bridge crews need with scaffold rigging winches, beam rollers, etc.
- Heavy duty ladders of various sizes to be determined by crew needs
- Skid steer pick up broom
- Skid steer concrete pump
- Traffic control devices
- Individual fall protection equipment. Note: all fall protection equipment shall be from the same manufacturer
- Other small hand tools, bars, shovels as needed

1.5.5 MATERIALS

Many different types of materials are required for preventive and reactive maintenance. Several sources are available for supply of these materials. Maintain an adequate supply of materials for routine repairs at storage points in each district. The re-supply of materials is managed through requisition by the districts as recommended by the Bridge Maintenance Supervisor or Bridge Superintendent.

Material in larger amounts or of a special nature may be obtained through requisition for the specific job by the districts.

Materials bought and stored for specific bridge repair projects should not be allocated to other projects by inventory control personnel. New or used salvaged bridge material should not be used on anything other than bridge repair jobs without the consent of the Bridge Maintenance Supervisor or Superintendent.

Discuss local purchasing of material with the Area Business Office and/or Inventory Control Supervisor.

In case of an emergency, contracts may be let and materials purchased without advertising for bids. An emergency is defined as a condition on a trunk highway that requires immediate work in order to keep the highway open for travel. These emergency powers cannot be invoked without the authority of a declared emergency by the Commissioner of Transportation in accordance with the provisions of [Minnesota Statute 161.32 Subd. 3](#).

Salvaged materials are stored in a number of storage sites throughout the state. When in-place structures are removed, the material may be salvaged for the state. Where Federal funds are involved, salvage value may be required to credit the project. Leftover materials from construction work such as piling and other items paid for under the contract and not used shall also be salvaged for the state. These materials should be stored at designated sites in a neat and organized manner. Annual inventories of these materials should be kept by the Bridge Maintenance Supervisor or Superintendent. On occasion, disposal of salvaged bridges may be made to other governmental agencies who are interested in their purchase. Disposal of this material should be coordinated with the Bridge Construction and Maintenance Engineer in the Bridge Office. Some temporary bridge inventories maintained in the Bridge Office indicate material available statewide.

While bridge materials are rising in price to a critical point, most bridge maintenance projects are heavily weighted on the labor cost because the amount of material used is often small. It is, therefore, a good policy to have adequate material with which to perform the work. Otherwise, delays and high labor costs can result.

1.6 TRAINING

Bridge maintenance workers are required to be skilled and knowledgeable in many areas relating to bridge preservation. Knowledge and skills also need to be continually updated to stay current with agency, environment, maintenance and technology changes. In order to develop and improve a bridge maintenance training program, each bridge maintenance worker should be assessed to identify any skill gaps and training needs.

Based on data collected from the 2012 employee skills assessment, MnDOT developed a Bridge Maintenance Training Program to meet the identified development needs. Some of the top needs identified included general knowledge of bridges and materials, high angle rescue, as well as best practices for concrete placement and finishing, joint repair, bearing repair, steel repair and welding.

To address the skill gaps identified in the statewide skills assessment, a Bridge Maintenance Academy training series was created.

- **Bridge Maintenance Academy I** is an online training that provides bridge maintenance workers a background in bridge components, bridge elements, design

concepts, plan reading, concrete, safety, traffic control and an introduction to bridge maintenance.

- **Bridge Maintenance Academy II** is hands-on training that exposes bridge maintenance workers to forming, tying rebar and pouring concrete for slabs and abutments; detecting, removing and patching delaminated areas; and installing stiffeners and/or diaphragms on structural steel members; as well as classroom presentations on formwork, structural steel and shotcrete.
- **Bridge Maintenance Academy III** is hands-on training that exposes bridge maintenance workers to setting elastomeric bearings and steel beams; installing and bolting steel diaphragms; forming, tying rebar and pouring concrete for a reinforced concrete deck; installing strip seal expansion joint extrusions and glands; performing a full depth deck patch; performing strip seal gland repairs; placing cribbing and executing bridge jacking; as well as classroom presentations on strip seal expansion joint maintenance, bearing maintenance and bridge jacking considerations.

The series was designed to combine traditional learning where basic concepts are introduced with hands on learning where students are tasked with performing the work themselves under the guidance of experienced bridge maintenance supervisors. With this design, students are more engaged and will retain more information.

Bridge Maintenance Academy II and III are both 5-day training courses that are typically held in February at a MnDOT truck station.

Other training courses that are available for MnDOT bridge maintenance workers include the following:

- Customized Welding for Bridge Maintenance
- Intermediate/Advanced Welding for Bridge Maintenance
- High Angle Rescue (HAR)
 - Initial (3-day class)
 - Refresher (2-day class)
 - Refresher Webinar (2-hour webinar)
 - Train the Trainer (1-day class)

High Angle Rescue training also combines classroom and hands on training that allow participants to learn and apply self-rescue and team rescue techniques. HAR tool box talks are also available on the internal MnDOT [Bridge Maintenance Supervisor's website](#).

Bridge preventive maintenance E-Learning modules were developed to communicate planning, equipment, materials and best practices associated with typical bridge preventive activities

- Crack Sealing,
- Strip Seal Gland Repair,
- Poured Joint Sealing, and
- Bridge Flushing.

Training registration for MnDOT personnel is available through the District Training Development Specialist.

Training resources and registration information for local agency personnel are available on the [MnDOT Bridge Training Website](#).

1.7 OTHER CONSIDERATIONS

Other factors may need to be considered when maintaining the bridge inventory around the state, such as:

- Lighting and power systems,
- Utilities,
- Navigable waterways, and
- Roadway, railroad or other areas under the bridge.

The following sections contain guidance for these considerations.

1.7.1 LIGHTING

Bridge lighting and power can be divided into the following categories:

1. Navigational aid lighting.
2. Airway obstruction lights.
3. Highway lighting.
4. Power for operation of movable spans, semaphores and gates.
5. Power for operation of pumps and ventilating fans.

The responsibility for the satisfactory operation of the above facilities rests with the Area Maintenance Engineer or as otherwise specified in an agreement. Failures in lighting and power must be corrected by temporary measures until permanent repairs can be made. Bridge maintenance forces can be of assistance in repairs and the Electrical Services Unit should be contacted when electrical problems arise.

The [Ninth Coast Guard District office in Cleveland, OH](#) (in MN, North of latitude 46-20'North) and [Eighth Coast Guard District Office in New Orleans, LA](#) (in MN, South of latitude 46-20'North) maintain lists of owners of bridges over navigable waters (see information below). These lists contain the name of the owner and the person or persons to be contacted for reporting navigational light deficiencies. This list is updated periodically and the Coast Guard should be notified whenever changes occur.

1.7.2 UTILITIES

Utilities such as electricity, water, gas, telephone and sewers are often attached to bridges and may also be carried through tunnels. Except for the electric power used on the bridge or carried across the bridge for MnDOT purposes, all other utility installations are regulated by permits and agreements with the various utility companies. These facilities are entirely the responsibility of the utility companies and all maintenance requirements and lack of maintenance should be referred to them by the Area Maintenance Engineer directly, or if necessary through the Utilities Engineer.

Where a structure is programmed for repair and/or painting by either MnDOT's personnel or contract, the affected Utility Companies should be contacted to determine what effect the proposed work will have on the utility. The companies may wish to participate in the proposed maintenance work or will coordinate the activities of their company in regards to the work.

1.7.3 REPAIRS OVER NAVIGABLE WATERWAYS

The US Coast Guard should be notified in advance of bridge inspection or maintenance activities over navigable commercial waterways. For the southern half of Minnesota, this would include the Mississippi River from the Iowa border up to the city of Minneapolis, the Minnesota River from Fort Snelling up to Shakopee, and the St. Croix River from Prescott up to Stillwater.

1. Notify the US Coast Guard District Bridge Contact.
 - a. Contacts can be found on the [US Coast Guard District Bridge Contacts Website](#).
2. Provide the following information:
 - a. Bridge description and location
 - b. Dates of bridge inspection and/or maintenance work
 - c. Work hours
 - d. Description of work and access equipment used
 - e. Contact information

Navigational lighting problems detected by MnDOT should be corrected as soon as possible. When the outage is first detected by the Coast Guard, they will notify MnDOT in writing that corrective work is needed and must be performed by a specified date. A return letter is required, containing a statement that the corrective work has been performed.

1.7.3.1 INFORMATION FOR BRIDGE OWNERS

The following information provided by the Coast Guard defines the responsibilities of the Area Maintenance Engineer or District Operations Engineer pertaining to bridges over navigable water:

The owners of all bridges over navigable waters of the United States are required to show prescribed marine navigation lights at night. Applicable sections of [Title 33, Code of Federal Regulations](#) are quoted below. **It is the user's responsibility to ensure that the text quoted below represents the most current version.**

§118.1 General requirements.

"All persons owning or operating bridges over the navigable waters of the United States or any international bridge constructed after March 23, 1906, shall maintain at their own expense the lights and other signals required by this part.

§118.5 Penalty for failure to maintain.

"Any person required to maintain lights and other signals upon any bridge or abutment over or in the navigable waters of the United States who fails or refuses to maintain such lights and other signals, or to obey any of the lawful rules and regulations relating to the same is subject to a penalty as provided in 14 U.S.C. 85."

§118.50 Inspection.

"Lights and other signals required or authorized under this part are subject to inspection at any time by Coast Guard personnel or authorized agents."

§118.55 Periods of operation.

"(a) Lights shall be displayed from sunset to sunrise and at other times when the visibility is less than one mile. "

“(b) Operators shall not be required to exhibit the prescribed lights during seasons when vessels are unable to navigate in the vicinity of the bridge. “

“(c) The operation of signals other than lights shall be as prescribed by the District Commander. Each case shall be considered individually.”

§118.60 Characteristics of lights.

“All lights required or authorized under this part must be securely attached to the structure and of sufficient candlepower as to be visible against the background lighting at a distance of at least 2,000 yards 90 percent of the nights of the year. Lights must meet the requirements of this part. Lights shall be fixed lights excepting as provided in §§118.95, 118.110 and 118.150 of this part. Color specifications are not prescribed for bridge lights, however, the chromaticity standards for navigation lights in 33 CFR Part 84—Annex I are recommended.”

Bridge owners requiring information to assist them in the proper installation and maintenance of navigation lights should address a request to the Bridge Branch, [8th Coast Guard District](#) south of latitude 46-20' in Minnesota.

The northern section of Minnesota north of latitude 46-20' is in the [9th Coast Guard District](#).

At this time, there are no Coast Guard defined navigable waters north of latitude 46-20'. If this should change, the following map shows this latitude as it crosses Minnesota:



1.7.4 ROADWAY, RAILWAY AND OTHER AREAS

Roadway sections, railroad right of way, parking lots, storage yards, building sites and other open areas under bridges should be maintained in accordance with existing permits and agreements. Vegetation should be controlled to prevent damage or deterioration to the structure. Before working on or under railway bridges, the railroad should be contacted. Every agency should have a current list of contacts for each railway in their area.