

Chapter 8

Guidance, Safety Devices and Road Closures

8.0 Introduction

Description

This program includes the repair and replacement of roadway signs, guardrails, end treatments and delineators; the placement of highway pavement markings and roadway striping; and identifies the procedures for road closures.

Purpose

The purpose is to maintain roadway features for the safety, guidance and information to the traveling public.

The following should be considered when establishing maintenance work plans:

- Safety of the public
- Liability for MDT
- Protection of MDT's investment
- Aesthetics

Approvals

One call (1-800-424-5555) is required before any digging. Approval should be requested at a minimum of two days in advance.

District Traffic Engineer or Area Maintenance Bureau Chief's approval is required before any changes in signage, striping or other guidance devices.

Specifications and requirements for installation and placement of traffic devices are covered in the Manual on Uniform Traffic Control Devices and MDT Guidelines for Work Zone Safety Handbook. The installation specifications for sign post system, guardrail, end treatments and similar devices are in the Standard Drawings Manual. Supervisors should periodically review the installation/placement standards to ensure that items such as signs, guardrail, and striping are being installed in accordance with MDT standards. Supervisors should ensure that all employees are aware of these standards.

Safety and Training

Supervisors should review safety, training and work zone requirements with employees and ensure compliance with approved guidelines. Employees should review all Material Safety Data Sheets (MSDS) to learn about the products used and to make themselves aware of safety and health precautions and required personal protective equipment.

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Environmental Best Management Practices

Supervisors should be aware of environmental concerns. Special precautions must be taken to protect water quality near streams, lakes and wetlands. Dispose waste materials at an appropriate site.

Resources

Maintenance Management System Manual

Manual of Uniform Traffic Control Devices (MUTCD) Chapter 6

MDT Employee Safety Policy and Procedures Manual

MDT Flagger's Handbook

MDT Guidelines for Work Zone Safety Handbook

Standard Highways Sign Manual

MDT Standard Drawings

Road Closure Policy

Road Fence Design

8.1 Traffic Signs (MMS 6101, 6102, 6103, 6104, & 6204)

Activity Description

This activity includes:

- Repairing, maintaining and replacing traffic signs, posts, and sign panels.
- Cleaning, tightening of bolts and straightening.
- Maintaining single post, double posts, overhead sign faces, hazard markers, chevrons and reference markers.

Purpose

The purpose of the work outlined under this activity is to maintain adequate signing for the benefit of motorists. Each category of signs fulfills a specific purpose as follows:

- **Warning Signs** advise motorists of potentially hazardous locations or conditions such as intersections, curves, work zones, railroad crossings and roadway surface conditions.
- **Regulatory Signs** advise motorists of traffic regulations that apply at a particular location such as speed zones, stop signs, pass with care and turn restrictions.
- **Guide Signs** provide directions and information such as route shields, destinations and services.

Timing of Maintenance

Signs critical to traffic safety should be repaired or replaced promptly. If prompt action is not possible, a temporary sign should be installed until a permanent repair or replacement can be made. Signs having a high priority for prompt replacement or repair may include:

Regulatory and Warning Signs

- Stop
- Yield
- Do Not Enter
- Wrong Way
- Curve
- Intersection
- Lane Reduction Transition
- Railroad Crossing

Sign messages should be maintained to an acceptable level of readability and reflectivity. The Manual of Uniform Traffic Control Devices establishes specified standards for signs. Signs should be cleaned or replaced when readability or retro-reflectivity of the sign message is obscured.

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Specialized Equipment

- Bucket Truck
- Hole Auger
- Concrete Mixer
- Crane
- Attenuator

Materials

- Sign panels
- Signposts
- Concrete
- Miscellaneous bolts, washers and nuts
- Cleaning supplies

Ordering

Orders for replacement signs or sign panels are initiated by the Field Maintenance Supervisor and submitted through the stockroom in the Area office.

To facilitate the order, the request must contain the following information:

- Section Name
- Quantity Requested
- Sign number
- Sign size\sign logo or description
- Requestor signature
- Date of order
- Approval signature

Metal and wood signposts and miscellaneous hardware are requested from the stockroom. Signs and posts are inventoried materials and require a stock issue sheet to be completed for acquisition.

Sign panels and posts should be stored in a safe and secure area in accordance with manufacturer's recommendations to prevent premature deterioration. Special precautions should be used when storing high intensity signs.

Individuals working with sign panels should use caution to prevent damage to the reflective sheeting.

Safety and Training

Supervisors should review safety, training and work zone requirements with employees and ensure compliance with approved guidelines.

Employees should review all Material Safety Data Sheets (MSDS) to learn about products used and to make themselves aware of safety and health precautions and required personal protective clothing.

All signpost bases require some type of excavation work. Supervisors should make sure they contact Underground Service Alert at 1-800-424-5555 at least two days before excavation. Overhead structures and electric wires should be checked before using aerial lift equipment.

Environmental Best Management Practices

Best management practices include:

- Disposing all treated wood posts at an approved landfill.
- Burning and/or burying treated wood posts are unacceptable.
- Returning damaged or deteriorated sign panels and metal posts to the yard and stockpile for sale as scrap as per Department of Administration – Surplus Property Division Guidelines.

Procedures

Signal maintenance is contracted where possible.

1. Review the proposed site of sign repair/replacement to determine if excavating is required. If required, mark the location and notify Underground Service Alert so the utilities can check the area.
2. Ensure that all sign panels, posts and hardware are available for the scheduled installation.
3. Set up appropriate traffic control.
4. Repair signs, posts or bases.
5. The date of installation must be placed on the back of each new sign panel by an approved method and is to be placed in the lower right hand corner when facing the rear of the sign.
6. Remove traffic control by reversing the process used to set up the control.

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8.2 Guardrail Repair and Replacement (MMS 6106)

Activity Description

Maintenance of guardrail (i.e. steel w-beam, cable, box beam, and jersey concrete barrier), involves

- Repairing or replacing damaged or deteriorated panels
- Replacing damaged posts
- Straightening or aligning posts and panels
- Replacing cables and posts
- Removing and replacing of concrete barriers
- Inspecting routinely to ensure proper tension in cables, torque on bolts.

Purpose

Guardrails are repaired and replaced in order to maintain its structural integrity.

Timing of Maintenance

When guardrails are damaged, temporary repairs should be made as soon as possible. The permanent repairs should be done as soon as feasible. In the interim, temporary traffic control devices, such as cones, drums, portable barriers and barricades, should be installed until permanent repairs or replacement can be made.

Specialized Equipment

- Auger truck for digging postholes.
- Cutting torch
- Attenuator
- Crane or lift
- Jersey rail lifting attachment

Materials

Materials needed for the guardrail repair may include but are not limited to:

- Steel guardrail panels and terminal end sections
- Guardrail posts and spacer blocks
- Bolts, washers and nuts
- Concrete “Jersey” type of barrier and pins
- Cable rail posts, cable clips or cable
- Pinned down curbs

Materials are purchased through requisition contracts and are generally obtainable from the division stock. Salvaged materials are often available for use in repairs. Any salvaged material should be checked prior to use to ensure materials are appropriate for use. Posts and blocks must be sound, not rotten. The rail must be straight and not flattened.

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Storage

Adequate guardrail material should be stockpiled so repairs can be made quickly. Materials should be stored in a location where they will be secure from loss or damage.

Safety and Training

Supervisors should review safety, training and work zone requirements with employees and ensure compliance with approved guidelines.

Employees should review all Material Safety Data Sheets (MSDS) to learn about products used and to make themselves aware of safety and health precautions and required personal protective equipment.

Special Precautions

MDT Standard Drawings need to be consulted to ensure repair treatments are within design standards.

Supervisors should ensure that Underground Service Alert clears the area prior to performing any drilling, digging, or post pounding. When replacing posts, care should be taken to ensure that backfill material is well compacted so the posts are held securely.

If cutting equipment is used, avoid breathing fumes from burning galvanized metal, as the fumes may be hazardous.

Environmental Best Management Practices

Environmental best management practices include:

- Protecting, in unstable situations, areas down slope from guardrail replacement with erosion control measures (silt fences and other appropriate devices) to minimize additional sediment loading into aquatic systems.
- Returning damaged rail and steel posts to the section and stockpiling for sale as scrap as per Department of Administration – Surplus Property Division Guidelines.
- Disposing appropriately of all treated wood posts at an approved landfill.
- Burning and/or burying treated wood posts are unacceptable.

Procedures

1. Contact local laws enforcement for responsible party.
2. Establish an account receivable (AR).
3. Set up appropriate traffic control
4. Remove damaged guardrail.
5. Install replacement guardrail.
6. Align guardrail.
7. Clean up area and dispose of damaged materials at appropriate sites.

8. Place appropriate erosion control if needed.
9. Remove traffic control.

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8.3 Pavement Striping (MMS 6201)

Activity Description

The activities are the placement of solid and skip pavement markings on pavement surfaces and applying glass beads to the lines as they are painted. Consult the Traffic Design Manual or the Maintenance Chief for specific pavement marking requirements.

Purpose

The purpose of this activity is to provide guidance and warning for drivers without diverting attention from the roadway in conjunction with other traffic control devices such as traffic signs or signals.

Timing of Maintenance

The goal is to have eighty-five percent (85%) of the restriping needs completed by July 1 of each year. This goal can be met utilizing Department equipment and personnel or through contracts. Employees required to administer paint contracts should be familiar with contract specifications. Pavement stripes should be renewed when they have lost retro-reflectivity or line integrity. Retro-reflectivity standards are being developed and will be included in this manual as soon as they are developed. Striping of maintenance overlays, chip seals, or other activities that obliterate the stripe, should be replaced as soon as practical.

Specialized Equipment

- Paint Striper
- Nurse Truck
- Attenuator
- Shadow Vehicle

Materials

Department-placed striping will be done with water-based paint.

- White traffic paint
- Yellow traffic paint
- Glass Beads
- Temporary striping tape
- Temporary marking tabs

Traffic paint and beads are purchased under a term contract administered by MDT's Purchasing Bureau. Superintendents should review their needs and place orders far enough in advance to ensure that paint will be available when needed.

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Retro-reflectivity is important in striping. Paint applications are typically placed at 15-16 mils wet to produce an 11-12 mils dry stripe. Bead application is typically 8-10 pounds per gallon of paint. However, standards may vary between contracts.

Contracted striping materials may include tape, water-born paint or other material that meet MDT's specification.

Storage

Paint and glass beads should be stored in a safe area and protected from freezing. Totes should be protected from damage and should not be stacked more than two high.

Glass beads and pre-formed plastic pavement markings should be stored under cover to protect them from weather.

Special Handling

Employees should be instructed on techniques and use of lifting equipment. Totes typically contain 250 gallons and weigh approximately 3,000 lbs. When lifting totes, harnesses and hooks need to be certified for the appropriate weight, checked and secured. Don't stand under totes as they are being lifted.

Beads are typically delivered in large sacks on pallets. Sacks weigh approximately 2,000 lbs. Use appropriate lifting equipment.

Empty paint containers should be stored in a safe area for pickup by the paint supplier. Dispose of empty bead containers at an appropriate site.

Safety and Training

Supervisors should review safety, training and work zone requirements with employees and ensure compliance with approved guidelines.

Employees should review Material Safety Data Sheets (MSDS) to learn about products used and to make themselves aware of safety and health precautions and required personal protective clothing.

Special Precautions

Water based paint should be applied according to manufacturer's recommendations.

A truck-mounted impact attenuator is required to be used on the protection vehicle.

Environmental Best Management Practices

Water based paints are relatively environmentally friendly. If there is a spill, the paint should be contained and transferred into containers. When cleaning guns or other equipment, cleaning waste must be collected and disposed of appropriately.

Procedures

1. Prepare Area striping plan well in advance of striping season.
2. Prepare equipment and provide training to striping crew employees when appropriate.
3. Prepare roadway for striping. Sweeping may be required.
4. Provide assistance to the Area paint-striping crew.

Traffic Control

Mobile Operation on Two Lane Roads

Two vehicles are used – the first is a warning vehicle and the second is a shadow vehicle with an attenuator. The first warning vehicle will have an arrow board or signs to warn-oncoming and passing traffic about the one-lane road. . MDT stripers will have arrow boards of an appropriate size (Type B 30 inches X 60 inches).

The appropriate vehicle will have a truck-mounted attenuator. This truck will also have warning signs. For additional information refer to MUTCD 2000, Part VI.

Mobile Operation on Multilane Road

Mobile operations for multi-lane, two vehicles are required. The protection vehicle (behind the striper) will be equipped with an arrow board and a truck mounted attenuator. The warning vehicle will be equipped with an appropriate arrow board and appropriate lane closure sign. Refer to MUTCD, 2000, Part VI for more information.

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8.4 Pavement Markings (MMS 6202)

Activity Description

This activity includes the placement of various markings, legends and symbols on the pavement surface. Markings include crosswalks and stop bars. Symbols and legends include directional arrows, word messages and letters for railroad crossings.

Purpose

The purpose of placing pavement markings on pavement surfaces, in conjunction with other traffic control devices such as traffic signs or signals, is to provide guidance and warning for drivers without diverting attention from the roadway.

Timing of Maintenance

Pavement stripes should be renewed when there is diminished visibility or retro-reflectivity. Reflectivity standards are being developed and will be included in this manual as soon as they are developed. When doing maintenance overlays, chip seals, or other activities that obliterate pavement markings, they should be replaced as soon as practical.

Specialized Equipment

- Hot torch
- Line grinder
- Walk-behind striper
- Air compressors

Materials

The following is a list of materials typically used. This is not a complete list for all available pavement markings:

- Water-based traffic paint
- Glass beads
- Pre-formed, thermo-plastic pavement marking materials.

Storage

Paint should be stored in a safe area and protected from freezing. Glass beads and cold plastic tape should be stored under cover to protect them from the weather.

Safety and Training

Supervisors should review safety, training and work zone requirements with employees and ensure compliance with approved guidelines.

Employees should review Material Safety Data Sheets (MSDS) to learn about products and used to make themselves aware of safety and health precautions and required personal protective clothing.

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Special Precautions

Pavement markings should be applied according to the manufacturer's recommendations.

Environmental Best Management Practices

Water based paints are relatively environmentally friendly. If there is a spill, the paint should be contained and transferred into containers. When cleaning guns or other equipment, cleaning waste should be collected and disposed of appropriately.

Procedures

1. Review pavement markings needs and develop a pavement-marking plan for ordering materials.
2. Set up appropriate traffic control.
3. Check layout of pavement markings.
4. Use preformed thermo plastic for legends, crosswalks and other transverse markings when beneficial. Thermoplastic should be placed in accordance with manufacturer's recommendations. This is the preferred method when appropriate.
5. Construct a stencil layout for new or obliterated pavement markings when using traffic paint.
6. Remove traffic control.
7. Clean up the equipment.

8.5 Maintenance of Delineators, Reference Markers and Snow Poles (MMS 6101 & 6105)

Activity Description

This activity includes the replacing of bent, broken or missing delineators, milepost markers and snow poles. It also includes repairing and installing guardrail delineation.

Purpose

Delineators are placed and maintained in order to delineate the edge of the roadway. Reference markers are maintained in order to provide a method of identifying specific locations along the highway. Snow poles are maintained to mark the edge of the roadway in high snow accumulation areas and areas of blowing and drifting snow.

Timing of Maintenance

Missing or damaged delineators should be repaired as soon as feasible. Cleaning should be accomplished as required to maintain retro-reflectivity.

Periodic inspection should be conducted to locate damaged or missing mileposts and delineators. Damaged milepost markers need to be identified and replacements ordered. Snow poles need to be purchased or fabricated and installed before the winter season.

Specialized Equipment

- A loader to remove damaged delineators and reference posts.
- Specialized post pounder for driving flexible delineators.
- One-ton truck-mounted lift crane.
- Hydraulic or air-powered post pounders if placing a significant numbers of posts.

Materials

The material description is as follows:

- Delineators for guideposts and guardrail reflectors
- Metal posts
- Flexible delineators, which include the reflective strip. The reflector should be the same color as the nearest pavement stripe.
- Miscellaneous hardware

Environmental Best Management Practices

Damaged metal posts should be salvaged for sale as scrap iron according to MDT policy. Damaged flexible markers or snow poles should be disposed of at an appropriate site.

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Procedures

1. Place required traffic control.
2. Clean, repair, or replace posts, delineator reflectors, reference posts, snow markers.
3. Remove traffic control

8.6 Flashing Lights, Traffic Signals & Luminaries (MMS 6109, 6110, 6204)

Activity Description

This activity includes the routine inspection, repair and preventive maintenance activities associated with roadway appurtenances such as flashing lights, traffic signals, and luminaries.

Purpose

The purpose of this activity is to ensure that all highway lighting is operational and supports are inspected and properly torqued.

Timing of Maintenance

Lights and signal bulbs frequently fail and require replacement. Routine inspections are required to ensure that all signals, lights and flashers are working properly. Inspection of luminaries is typically done at night and deficiencies reported to the area office. Deficiencies should be reported promptly and monitored for timely repair.

Specialized Equipment

- Bucket truck
- Torque Wrench

Materials

- Miscellaneous hardware for breakaway assemblies.
- Flashers, bulbs, lenses, etc.
- Paint for painting existing painted posts. Recently installed posts are galvanized and do not require painting.

Safety and Training

Supervisors should review safety, training and work zone requirements with employees and ensure compliance with approved guidelines. Employees should review Material Safety Data Sheets (MSDS) to learn about products and used to make themselves aware of safety and health precautions and required personal protective clothing.

Environmental Best Management Practices

Damaged metal poles and other metal parts should be salvaged for sale as scrap iron according to MDT policy.

Procedures

1. Inspect all flashing lights, traffic signals, and luminaries.
2. Place appropriate traffic control.
3. Make repairs.
4. Remove traffic control.

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8.7 Impact Attenuators (Crash Barriers), Repair to Escape Ramps (MMS 6111)

Activity Description

This activity includes the repair or replacement of impact attenuators (crash barriers) that have deteriorated or been damaged by accident or vandalism. It also includes the repair of safety escape ramps.

Purpose

Impact attenuators are repaired and replaced to ensure that they function as designed and adequately protect the motoring public. Escape ramps are used as a safety device.

Timing of Maintenance

Damage or debris that impairs the functional integrity of an attenuator should be corrected immediately. In cases where the repairs cannot be made immediately, temporary barriers and warning devices should be placed.

Impact attenuators should be inspected routinely to ensure the system is functional.

Escape ramps should be inspected routinely to ensure they will function as designed.

Materials

The complete attenuator unit consists of several components such as metal rails, cross pieces, cushions, nosepiece and related hardware.

Safety and Training

Supervisors should review safety, training and work zone requirements with employees and ensure compliance with approved guidelines.

Employees should review Material Safety Data Sheets (MSDS) to learn about products used and to make themselves aware of safety and health precautions and required personal protective clothing.

Special Precautions

When repairing or replacing the attenuator, care should be taken to ensure that debris and other accumulations are cleaned from around the unit. Accumulation of debris can hinder the sliding action and impair the functioning of the device. Special attention should be given to ensuring that the attenuator is installed according to the manufacture's recommendations.

Environmental Best Management Practices

Obsolete or damaged metal parts should be stockpiled for sale as scrap iron. Damaged cushions should be disposed at an appropriate site.

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Procedures

Impact Attenuators

1. Set up traffic control devices.
2. If temporary devices were used prior to repair, remove all temporary items and clean up area around the attenuator.
3. If permanent repairs are being made immediately after an accident, remove the damage parts and clean up area around attenuator.
4. Install new parts in accordance with manufacturer's recommendations.
5. Align rails, cross pieces and tighten to recommended torque.
6. Ensure that appropriate delineation is installed at the nose of the attenuator.
7. Clean up debris and haul damaged materials to the section or to an appropriate disposal site.
8. Remove traffic control.

8.8 Road Closure (MMS 6205)

Activity Description

This activity includes placement of traffic control devices for the temporary closure of a highway because of weather, accidents or disasters. MDT is responsible for determining when roads should be closed because of snow and other conditions. The Director of the Department of Transportation has delegated responsibility for a closure to the Area Maintenance Bureau Chiefs.

Purpose

The purpose of an emergency road closure is to protect motorists from potentially life threatening conditions.

Timing of Maintenance

The road should be closed when conditions are unsafe for normal traffic and when it is hazardous to continue normal maintenance operations without undue risk to personnel.

Examples of conditions for closing a road are the following:

- High winds
- Deep snows that plows are not able to remove
- Blowing snow/dirt causing near zero visibility
- Snow drifts/slides
- Extremely slick roads
- Hazardous material spill
- Traffic blockage because of an accident (Usually a closure of short duration done by Montana Highway Patrol.)
- Natural Disasters/Acts of God such as floods, forest fires or land/rock slide or a threat of them.

Cooperation is expected between the Field Maintenance Supervisor and local law enforcement. The Highway Patrol Supervisor and local law enforcement should be kept informed of impending closures in case their help is needed to clear traffic from within the area.

The decision on when to close a highway, how much of the highway to close and when to open the road to traffic rests with the Area Maintenance Bureau Chief. Closures should be managed so as not to close short portions of routes that would leave motorists stranded on roadways without potential for shelter.

The placement, maintenance and removal of road closure signs and barricades are the responsibility of the sections.

Enforcement of road closure is the responsibility of the Highway Patrol. Except for extraordinary circumstances as deemed necessary by the Maintenance Chief, and/or

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Highway Patrol supervisor, MDT personnel will **not** be required to remain at the road closure barricade after the closure has been placed. When flaggers are required, proper signing and lighting will be used and the flaggers will follow the procedures in the MDT Flagger Manual.

Specialized Equipment

- Arrow Boards
- Portable Work Lights

Materials

Necessary traffic control signs and barricades to establish a road closure.

Safety and Training

Supervisors should review safety, training and work zone requirements as well as closure responsibility and notification requirements with employees, and ensure compliance with approved guidelines.

All employees should be aware and use safety and health precautions and wear required personal protective clothing.

Special Precautions

Under no circumstances is an employee of MDT authorized to redirect the traveling public over another route except as authorized by the Area Maintenance Bureau Chief.

Procedures for Closing a Road

1. The section requests a road closure.
2. Area Maintenance Bureau Chief or designee reviews and approves request.
3. Area office will notify law enforcement, media, adjacent District/Area, etc. and update the traveler information system of closure and when road is to reopen.
4. Signs and barricades are placed as per MUTCD, Chapter 6.
5. The Field Maintenance Supervisor will notify the Area office of the following:
 - Time when closure was established
 - Location of closure

Review Road Closure Policy for specifics.

For hazardous spills, the local Disaster and Emergency Services Coordinator (DES) will be notified. The incident commander will have authority to reopen the road.

When reporting accidents or other activities that require assistance from the Highway Patrol or other law enforcement agency, provide the following information:

- Location (route, reference post and direction).
- Injuries if any, but do not broadcast names of the injured over the radio.

- Number of vehicles involved and type of vehicles, license plate number and state.
- An explanation on whether the person calling in the information is standing by or providing assistance.
- State vehicles or employees are involved, if any.

Highway Condition Reports – Road Reporting

The statewide winter road reporting system is activated in October and continues through March. Road conditions are usually reported to dispatch in the early morning and afternoon. Road conditions should be updated to help keep the public informed about changing road conditions.

Public Relations

Success of the winter maintenance program is largely dependent on how well other agencies and the public understands the program. For good understanding, District/Area managers should keep other agencies and the public well informed. Both formal and informal meetings with law enforcement and other stakeholders are useful. Cooperating with and informing the news media can take several forms. Press releases and interviews are effective. The Transportation Awareness Plan (TAP) program is offered to drivers' education classes, clubs, and organizations to help the public understand the winter maintenance program of MDT as well as other MDT operations.

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