Department of Transportation and Infrastructure Renewal

Highway Programs

HIGHWAY MAINTENANCE STANDARDS

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NOVA SCOTIA DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE RENEWAL

HIGHWAY MAINTENANCE STANDARDS

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1. All maintenance work and materials shall conform to the Department's "Highway Construction and Maintenance Standard Specifications" and "Manual 23", except as modified in these Maintenance Standards.

2. The Supervisor shall be defined as any person designated by the Area Manager to supervise maintenance activities as described in these "Maintenance Standards". The Supervisor or other designated person may also direct others (CUPE staff) to perform work as required to meet these "Maintenance Standards".

3. On or before 30th Nov of each year, the Area Manager shall be responsible to obtain the "Annual Condition Defects Report" from each Supervisor. This Report shall be used to prioritize and plan work for the upcoming maintenance season.

   This report shall be considered a priority list of major maintenance projects only. Typical projects usually greater than $5,000 in value shall include spreader patching, graveling roads, cross culvert replacement and bridge check replacement. Routine maintenance work such as repairing washouts or replacing driveway culverts and capital reconstruction work shall not be included in this report.

   If required, each deficiency shall be accompanied with a brief proposal on how to rectify the deficiency and an estimate of the cost for the proposed work.

4. The supervisor shall maintain complete and accurate records of work completed during the year.

5. The timelines of these "Maintenance Standards" do not apply during the following periods with the exception of pothole patching and immediate hazards:

   - Winter operations (December to March)
   - Spring shoulder season (4 weeks past official end of winter operations)
   - Spring weight restrictions

   When performing summer maintenance activities (other than pothole patching) during these periods, the Supervisor shall make every reasonable attempt to follow the timelines of these "Maintenance Standards" when practically possible.

6. During summer, winter and spring shoulder season operations, when the Supervisor encounters or is made aware of hazardous conditions (any condition which poses significant and immediate danger to the motoring public), he shall immediately take whatever safety precautions are necessary to safeguard the

traveling public. If required, repairs shall be scheduled as soon as practically possible.

7. It is the responsibility of the Supervisor to ensure that the highway right-of-way is maintained in a condition that ensures safe passage of vehicular traffic.

8. This "Maintenance Standard" establishes levels of service for maintenance activities on Provincial Highways. The following table defines highway maintenance levels of service based on road classification and traffic volumes.

Pothole Criteria and Response Time Table

LEVEL OF SERVICE	Level 1A	Level 1B	Level 2	Level 3	Level 4
Type of Roads	All 100 Series and selected high volume highways	All Trunks and selected highways as per AADT limits	All Routes and selected highways as per AADT Limits	All local roads	All gravel roads
AADT Limits	Greater than 7,500	Between 7,500 – 4,000	Between 4,000 – 1,500	Less than 1,500	N/A

9. Where possible, the Supervisor may combine road patrols with other work being carried out during the day (or shift). The "Routine Road Patrol Frequency Table" below sets out the minimum frequency of inspections necessary to ensure reasonable levels of service on sections of highway, which have not been inspected during the normal course of other duties.

Routine Road Patrol Frequency Table

LEVEL OF SERVICE	FREQUENCY
Level 1A	2 times/week
Level 1B	1 time/week
Level 2	1 time/2 weeks
Level 3	1 time/month
Level 4	1 time/month*

** Level 4 with AADT less than 50 vehicles may be inspected 1 time/2 months*

In addition to the above stated frequencies, additional road patrols may be required to cover the following situations:

- Unique, unusual situations such as special events, truck routes, etc.
- During spring break-up on highway subject to weight restrictions
- During and after high wind or heavy rain
- On Halloween
- Emergency call out
- Deteriorating weather and driving conditions

10. These Highway "Maintenance Standards" have been approved by the TIR Executive Director of Maintenance and Operations and shall apply to all TIR maintenance field staff. Subsequent reviews will be made yearly and revisions issued as required.

11. As part of the ongoing review process, specific geographic areas will be audited throughout the summer and winter seasons. These audits are intended to compare present field practices with these TIR "Maintenance Standards".

12. It is recognized that during the performance of these standards, timelines may not be achievable under conditions beyond TIR control. When work cannot be completed within the timelines of these standards as a result of conditions beyond TIR control, the Supervisor shall document the conditions and correct the deficiency as soon as practically possible. Only the conditions listed below are considered to be beyond TIR control:

    12.1 Unsuitable weather conditions
        i. i.e. extended grading cycle time due to rain
        ii. as verified by Environment Canada historical data

    12.2 Severe storm conditions

    12.3 Motor vehicle accidents

    12.4 Major infrastructure failures

GENERAL

The objective of highway surface maintenance will be to ensure that traveled portions of the highway right-of-way are maintained in a condition that permits safe passage of vehicular traffic.

The following “Maintenance Standards” outline the requirements for maintenance operations. These standards are set out in various components which make up the highway roadside system within the limits of the right-of-way.

Activity Type110	Grading
Activity Type 111	Shoulder Maintenance
Activity Type 119	Grading Shoulders
Activity Type 113	Dust Control
Activity Type 121	Street Sweeping
Activity Type 123	Gravel Patching
Activity Type 132	Hand Patching
Activity Type 170	Spreader Patching
Activity Type 145	Storm Damage
Activity Type 199	Unclassified Maintenance

DEFINITION

Grading is work performed by use of a grader on gravel roads to smooth and reshape the riding surface and to restore the proper cross section (no material added).

PURPOSE

Traffic and weather conditions may cause deterioration of the travel surface of a gravel road which affects motorists' ability to operate at a reasonable and safe speed. Grading restores proper conditions to the road surface to improve ride quality and drainage.

GENERAL

A gravel surface is one constructed with compacted granular material. This provides a riding surface for highways with lower traffic volumes.

Grading is performed to shape the road to a uniform surface cross section.

Rocks or debris as a result of grading operations that may pose a hazard shall be removed as soon as detected.

When conditions, as outlined in the "Standard" section, cannot be met through regular grading techniques, granular materials will be added as required (see "Activity Type 123, Gravel Patching").

When grading will not provide a passable travelled surface, vehicle weight restrictions may be applied to the road. If the road becomes impassable, it will be closed, subject to the approval of the Area Manager.

INSPECTION – Road Patrols

During routine inspections or as situations arise, the Supervisor shall record deficiencies, post warning signs and schedule repairs as specified in the following "Standard" section.

STANDARD

The Supervisor shall repair all defects listed below within 14 days of detection, weather permitting.

- **Potholes:** Potholes are bowl-shaped depressions in the road surface. These potholes can be round, oval, or irregular in shape and vary in depth.

  Potholes shall be repaired when traffic must **significantly** reduce speed or deviate from the normal travel plane.

- **Distortions:** Distortion is any deviation of the road surface from its original shape (other than that described in "Subsection 3 – Washboarding" below). Distortion usually takes the shape of dishing, bumps or dips, all of which give rise to pitch, roll, or a jarring drop in a moving vehicle.

  Distortions shall be repaired when traffic must **significantly** reduce speed or deviate from the normal travel lane.

- **Washboarding:** Washboarding is a series of ripples perpendicular to the direction of travel most often experienced on hills.

  The road surface shall be graded when a vehicle **significantly** chatters and bounces as it travels over a washboard surface, deviates from the normal travel lane or must significantly reduce speed.

- **Rebuild Cross Section:** When the crown of the road is non-existent, or reverse with road edges higher than the centre portion of the road surface, proper drainage of the road surface will be affected.

  The original cross section shall be re-established to allow the free flow of water from the road surface.

- **Displaced Material**: Granular material will be displaced from the travelled portion of the roadway as a result of snow removal operations and vehicular traffic.

  Wherever possible, displaced material shall be reclaimed to re-establish the original cross section and is typically done during spring and fall grading.

RESOURCES

Equipment: 1-2 graders

Labor: 1-2 operators

Materials: Covered under “Activity Type 123, Gravel Patching” (Chapter 1, Section 7)

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices.
- Road sections identified for grading shall be planned so all sections can be completed within one work day taking the weather forecast into account.
- Damp **(not wet)** weather provides the optimum conditions for grading and takes advantage of moisture for compaction.
- Graders will be used to recover materials and to remove vegetation from road edges and side slopes.
- Material shall be pulled from the outer edges toward the middle and worked back and forth to create the proper cross section.
- The crown shall be 3%, and curves will have super elevation.

METHOD OF MEASUREMENT

Kilometres of completed grading (measured linear from start to end of grading). No counting of lanes or passes.

NORMAL OUTPUT

5-8 kilometres per day for single grader

DEFINITION

Shoulder maintenance is repairing or restoring washouts and low shoulders on non-paved shoulders by adding new gravel or recycled asphalt or using existing material.

PURPOSE

To eliminate road shoulder hazards and restore proper road surface drainage.

GENERAL

A non-paved shoulder is that portion of the roadway which is adjacent to and runs parallel to the pavement or travelled portion of the road. Shoulders give lateral support to the road structure, allow run-off of the surface water, and may provide an area for the emergency refuge off the travelled portion of the roadway.

Shoulder Maintenance is intended to ensure an acceptable shoulder surface, proper slope, and to provide a smooth transition from the edge of pavement to the gravel shoulder.

INSPECTION – Road Patrols

1. During routine inspections, or as situations arise, the Supervisor shall record deficiencies, post warning signs and schedule repairs as specified in the following “Standard” section.

2. The Supervisor shall provide the Area Manager with a prioritized list of road sections that exhibit the conditions as specified in the “Standard” section. This list shall be included in the “Annual Condition Defects Report”.

3. After winter operations are completed, early spring inspections are to be carried out to check for additional condition defects. Any deviations from the previously submitted “Annual Condition Defects Report” must be reported to the Area Manager.

STANDARD

1. Erosion/Washouts/Low Shoulders less than 100 metres in length

Erosion and washouts are the loss of shoulder material. This condition usually occurs during rain storms, sea surges or when snow melts. The most common problem areas are where guardrail has been installed, along and/or at the bottom of steep grades, and inside of turns.

All washouts and low shoulders shall be repaired as outlined in the "Erosion, Washout and Low Shoulders Response Time Table" below.

Low shoulders exist when the shoulder material is not flush with the edge of the pavement. This condition usually occurs due to insufficient granular material.

All washouts adjacent to the edge of travelled lane and any low shoulders that pose a potential hazard to the traveling public shall be signed within 24 hours of detection.

Erosion, Washout and Low Shoulder Response Time Table

Erosion, Washout and Low Shoulder Response Times	**Depth of Deficiency** (For all Levels of Service)		
	100 mm to 150 mm	151 mm to 300 mm	Greater than 300 mm
Less than 100 m in length	30 days	7 days	Immediately

2. Washouts / Low Shoulders greater than 100 metres in length

For continuous lengths greater than 100 metres and greater than 100 milimetres in depth, repair work shall be based on the "Annual Condition Defects Report", at the discretion of the Supervisor. All washouts adjacent to the edge of travelled lane and any low shoulders that pose a potential hazard to the traveling public shall be signed within 24 hours of detection.

RESOURCES

Equipment: 1-2 tandem or single axle trucks
1 backhoe, excavator, or grader
Compactor (optional as per circumstances)

Labor: 1-4 operators
2-4 crew persons

Materials: Granular material or
Recycled asphalt

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices.
- Identify source of problem and eliminate it by re-grading, adding material **and**/or diverting water.
- Repair damage by recovering washed-out material if possible or adding material at the damage site.
- Compact as required, bring to grade and re-compact.

METHOD OF MEASUREMENT

Tonnes

NORMAL OUTPUT

15 to 45 tonnes of granular material

DEFINITION

Reshaping and restoring non-paved shoulders by use of a grader and recovering windrowed material (no new material). If new material is added all costs for the operation will be accounted for under "Activity Type 111, Shoulder Maintenance".

PURPOSE

To re-shape and re-grade existing shoulders; to restore smoothness and the cross-grade; to eliminate windrows which restrict drainage.

GENERAL

A non-paved shoulder is that portion of the roadway which is adjacent to and runs parallel to the pavement or travelled portion of the road. Shoulders give lateral support to the road structure, allow run-off of the surface water, and may provide an area for the emergency refuge from the travelled portion of the roadway.

Shoulder grading is intended to ensure an acceptable shoulder surface, proper slope and to provide a smooth transition from the edge of pavement to the gravel shoulder. Shoulder grading includes grading material at guardrail locations and sweeping the road surface after grading.

INSPECTION – Road Patrols

1. During routine inspections or as situations arise, the Supervisor shall record deficiencies, post warning signs and schedule repairs as specified in the following "Standard" section.

2. The Supervisor shall provide the Area Manager with a prioritized list of road sections that exhibit the conditions as specified in the "Standard" section. This list shall be included in the "Annual Condition Defects Report".

3. After winter operations are completed, early spring inspections are to be carried out to check for additional condition defects. Any deviations from the previously submitted "Annual Condition Defects Report" must be reported to the Area Manager.

STANDARD

1. High Shoulders / Windrows

   This is the build-up of gravel at the outside edge of the shoulder, and at guard rail locations.

   The Supervisor shall take corrective action to ensure sheet water flow reaches the ditch. High shoulders or windrows are to be eliminated within 120 days of identification.

   Windrow material located under guard rail shall be recovered through regular shoulder maintenance activities.

2. Shoulder Grading

   Shoulder grading operations are generally scheduled in the spring to bring back gravel pushed out during snow removal operation.

   The Supervisor is responsible for grading of all gravel shoulders on all level 1A, 1B and 2 highways on a minimum rotation of once every three years.

   To meet the above conditions, the Supervisor shall include a grading schedule in the “Annual Condition Defects Report”.

   Subsequent grading shall be performed as required.

RESOURCES

Equipment: 1-2 graders
1 attenuator (as required)
1 sweeper (utility tractor)
1 roller

Labour: 3-5 operators
Traffic control (as required)

Material: Not applicable to this activity

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices as required.
- First pass - recover the outer-most material and pull it toward and onto the edge of the paved surface overlapping 300 to 600 mm.
- Second pass - grade the material from the windrow of the first pass to establish the correct shoulder grade. Care shall be taken to re-grade the material without damaging the asphalt.
- Sweep the asphalt surface after the second pass.
- Roll the shoulder to compact the material.

METHOD OF MEASUREMENT

Kilometers of completed (single lane) shoulder

NORMAL OUTPUT

10-20 km of single lane shoulder per day

DEFINITION

The application of dust control product to control airborne dust created by traffic.

PURPOSE

To mitigate the negative effect of airborne dust with respect to visibility and nuisance dust.

GENERAL

Work under this activity includes contracted supply and/or application.

Dust control products shall conform to the requirements outlined in the “Highway Construction and Maintenance Standard Specification”, February 1, 1997 or latest edition. Specifications and application rates are provided in “Calcium Chloride” (Division 6, Section 7) or “Magnesium Chloride” (Division 6, Section 11).

Depending on local conditions, higher rates may be used where traffic volume warrant or for stabilization purposes. Lower rates may also be used provided the reoccurrence of dust does not exceed Standard 1.2.

The Supervisor may elect to use other dust control products only with prior approval of the Area Manager. Alternative dust control product must have the equivalent dust suppressant ability as other TIR approved products.

The application of dust control shall stop 15 metres before any paved surface.

INSPECTION – Road Patrols

During routine inspections or as situations arise, the Supervisor shall record deficiencies and schedule repairs as specified in the following “Standard” section.

STANDARD

1. Dust Control

    1.1 The Supervisor shall apply dust control product annually to gravel surfaces as listed below prior to June 30th**,** provided weather conditions permit.

        1.1.1 50 metres on either side of residential and commercial buildings.

        1.1.2 The complete length of high volume local roads, densely populated subdivision roads and truck routes.

        1.1.3 Roads bordering agricultural land as approved by the Area Manager.

        1.1.4 50 meters on each leg of an intersection.

        1.1.5 Horizontal alignments with restricted sight distances as approved by the Area Manager.

    1.2 Additional applications may be required where the dust control's effectiveness has diminished over the course of the summer resulting in the occurrence of dust exceeding a height of 2 metres.

RESOURCES

Equipment: Truck or trailer mounted high volume tank c/w spray bar
Contracted tanker

Labor: 1 operator

Material: Dust suppression product (calcium or magnesium chloride)

NORMAL PRACTICE

- Apply dust suppression product within 24-48 hours of final spring grading.
- Maintain inventory to allow timely scheduling of application as delivery may be delayed.

METHOD OF MEASUREMENT

Kilolitres of product applied

NORMAL OUTPUT

3.9 to 6.8 kilolitre/day

DEFINITION

The removal and disposal of sand, granular material, and small debris from paved surfaces including intersections, shoulders, curbed streets and bridges, and along jersey barriers by hand or mechanical sweepers.

PURPOSE

To prevent drainage problems on highway surfaces created by blockages; to prevent encroachment of granular material from intersecting roads or from the shoulder area onto the traveled portion of the roadway.

GENERAL

Sweeping of sand, gravel or any other debris resulting from motor vehicle accidents or unsecured loads, where costs are not recoverable, shall be recorded under this activity.

INSPECTION – Road Patrols

During routine inspections or as situations arise, the Supervisor shall record deficiencies and schedule repairs as specified in the following “Standard” section.

STANDARD

1. Winter sand, gravel and debris shall be removed from areas such as shoulders adjacent to barrier walls, curbs and gutters, intersections, paved shoulders, bullnoses, gore areas, asphalt gutters, paved medians, subdivision streets and bridge decks including bridge curbs and sidewalks.

2. Sweeping of paved shoulders and roads with curb and gutter shall be completed before cleaning of catch basins and sewers is undertaken.

3. Removal of sand and gravel from paved shoulders, bullnoses and gore areas, etc., shall be completed before pavement marking and line painting operations begin.

4. When detected, sand, gravel or any other foreign material that is present on the paved travelled surface and that may be a contributing factor in an accident, shall be removed immediately.

RESOURCES

Equipment: Mechanical vacuum truck or utility tractor (sweeper)
Attenuator (where required)
Motorized hand sweeper
Push-brooms

Labor: 1 operator (as required by situation)
1-4 laborers

Material: Not applicable

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signage and traffic control devices as required.
- Where build-up has compacted over time, loosening by hand may be required along curbed sections.
- Sweep and collect materials for disposal or reuse.
- Material collected by a self contained vacuum truck must be transported for disposal or re-use as appropriate.

METHOD OF MEASUREMENT

Hectares (area swept by hand should be estimated to the nearest .01 hectare)

NORMAL OUTPUT

1.75 hectares / day

DEFINITION

Gravel patching is the application of granular material on existing gravel roads.

PURPOSE

Placement and grading of gravel to strengthen and shape sections of non-paved and gravel surfaces to provide a smooth surface of uniform cross section.

GENERAL

1. Excavation and backfilling of base failures shall be included in this activity.

2. A gravel surface is one constructed with compacted granular material. This provides a riding surface for highways with lower traffic volumes.

3. Rocks or debris from the gravel patching operation that may pose a hazard shall be removed as soon as detected.

4. When gravel patching does not provide a passable travelled surface, vehicle weight restrictions may be applied to the road. If the road becomes impassable, it will be closed, subject to the approval of the Area Manager.

INSPECTION – Road Patrols

1. During routine inspections or as situations arise, the Supervisor shall record deficiencies, post warning signs and schedule repairs as specified in the following “Standard” section.

2. The Supervisor shall provide the Area Manager with a prioritized list of roads that require large amounts of granular material (greater than 500 tonne) that frequently exhibit the conditions as specified in the “Standard” section. This list shall be included in the “Annual Condition Defects Report”.

3. After winter operations are completed, early spring inspections are to be carried out to check for additional condition defects. The Area Manager is to be advised if changes are required to the annual report.

STANDARD

The Supervisor shall repair all defects listed below within 14 days of detection, **weather permitting. If the following deficiencies cannot be repaired under "Activity 110, Grading", then gravel patching may be undertaken.**

- **Potholes:** Groups of irregular shaped holes of various sizes in the gravel surface. Potholes shall be repaired when traffic must significantly reduce speed or deviate from the normal travel lane.

- **Distortions:** Any deviation of the road surface from its original shape (other than described in "Washboarding", below). Distortion usually takes the shape of dishing, bumps or dips which are noticeable, all of which give rise to pitch, roll, or jarring drop in a moving vehicle.

- **Soft Areas:** Subgrade soils are punched up through the gravel surface, usually with the broken surface area surrounded by depression or dishing type of distortion. Distortion is likely to occur at wheel tracks.

- **Loss of Gravel Surface:** Loss of gravel surface and exposure of sub-base on roads with an AADT greater than 50. Granular material is added for structural strength.

- **Flat or Reverse Crown:** Slope of the road is flat and non-existent, or reverse with road edges higher than the centre portion of the road surface. Proper drainage of the road surface will be affected. The condition is considered severe when the cross fall is flat or near flat, or when the edges of the road are higher than the road surface thereby trapping or preventing surface water to drain away.

- **Washboarding:** A series of closely spaced crests and valleys with the ripples perpendicular to the direction of travel.

RESOURCES

Equipment: Loader
Grader
Trucks (06 or 08) – depends upon truck haul length

Labour: Loader operator
Grader operator
Truck drivers

Materials: Granulars – refer to "Standard Specifications"

NORMAL PRACTICE

- Erect temporary signing and control devices.
- Excavate soft areas, if required.
- Haul and place gravel as required.
- Compact if necessary.

METHOD OF MEASUREMENT

Tonnes of aggregate

NORMAL OUTPUT

200-1000 tonnes per day

DEFINITION

Hand patching is the process of repairing paved surface defects with hot or cold mix asphalt material placed by hand or automatic patching machine. This includes patching potholes, depressions, pavement edge defects or distressed areas and asphalt gutters.

PURPOSE

To eliminate traffic hazards by filling holes and leveling depressions in the surface and to restore riding quality.

GENERAL

For pothole, miscellaneous patching, and asphalt gutter installation, any preparation work involved such as removal of asphalt and/or gravel and installation of granular material up to a depth of 300 mm shall be included in this activity.

Cold mix asphalt is normally used when hot mix asphalt is not available.

INSPECTION – Road Patrols

1. During routine inspections or as situations arise, the Supervisor shall record deficiencies, post warning signs, schedule repairs and report as specified in the following “Standard” section.

2. The Supervisor shall provide the Area Manager with a prioritized list of road sections that frequently exhibit the conditions as specified in the following “Standard” section. This list shall be included in the “Annual Condition Defects Report”.

STANDARD

1. <u>Potholes</u>

   When weather conditions permit, asphalt concrete hand patching will be undertaken to repair potholes in accordance with these “Maintenance Standards”.

Potholes that are causing a hazard shall be repaired immediately. A hazard is defined as a condition which poses a significant and immediate danger to the motoring public.

Pothole conditions not meeting the minimum criteria listed in the "Pothole Criteria and Response Time Table" shall be repaired within the construction season. Work shall be performed in conjunction with other maintenance activities in the vicinity of the pothole.

Pothole Criteria and Response Time Table

Pothole Criteria	Level 1A	Level 1B	Level 2	Level 3
Description	Potholes which are greater than 0.10 m^2 in area (i.e. 0.3 m x 0.3 m) and greater than 100 mm deep.			
Action	Sign immediately and repair within 7 days	Sign immediately and repair within 7 days	Sign within 24 hours and repair within 21 days	Sign within 24 hours and repair within 60 days
Description	Potholes which are greater than 0.10 m^2 in area (i.e. 0.3 m x 0.3 m) and between 50 mm and 100 mm deep.			
Action	Sign immediately and repair within 14 days	Sign immediately and repair within 14 days	Sign within 24 hours and repair within 60 days	Sign within 24 hours and repair within 120 days

2. Hand Patching

When planning work or establishing priority lists for asphalt patching the following types of defects shall be considered:

- Large concentration of small potholes.
- Segregation/Raveling: Pavement material loss leaving voids in the surface.

- Wheel rutting: A longitudinal surface depression developed in the wheel tracks exceeding 20 mm.
- Rippling: Wavy or washboard effect running across the pavement.
- Cracking: Includes longitudinal, transverse, alligator and edge cracks.
- Edge loss: Loss of pavement surface adjacent to the shoulder.
- Distortions: Any deviation of the pavement surface from its original shape.
- Flushing: Pavement surface appears polished or asphalt cement appears on the pavement surface.
- Water ponding: Collection of water on the traveled portion of the highway.
- Repairs around various structures including catch basins, manholes, bridge approaches and bridge drains.

3. Asphalt Gutter Installation

The Supervisor shall note gutter defects that prevent the movement of water including deteriorated asphalt, loss of shape, cracking, worn edges, and excessive gaps between the gutter and the edge of pavement.

Replacement or additional installations of asphalt gutter shall be determined by the Supervisor.

RESOURCES

Equipment: 1 – 2 dump trucks
Compactor (tamper, small roller)
Hand tools (rakes, shovels, wheel barrow)
Tack applicator

Labour: 2 – 3 operators
1 - 2 rakers
1 – 2 crew person(s)
Traffic Control persons (as required)

Materials: Tack
Asphalt (hot or cold mix)
Sand (optional for cold mix)

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices.
- Clean out repair area by removing all loose materials.
- Tack coat area to be patched by using a hand spray. Ensure all edges are tacked.
- Place asphalt mix into depressions to bring surface to the desired grade when compacted.
- Level asphalt mix with hand tools.
- Compact with a hand packer or roller – compaction is particularly important.
- A dusting of sand may be used to prevent tracking of cold mix.

METHOD OF MEASUREMENT

Tonne of asphalt mix

NORMAL OUTPUT

Cold mix: 1–5 tonne per day
Hot mix: 15-45 tonne per day

DEFINITION

Spreader patching is the process of repairing paved surface defects with hot mix asphalt material placed by a mechanical spreader.

PURPOSE

To eliminate traffic hazards, to improve riding quality and road surface conditions by leveling depressions and restoring crown or superelevation.

GENERAL

Spreader patching is typically performed by contractors equipped with approved mechanical spreaders capable of achieving results as specified in the “Standard Specification for Construction Projects”.

Spreader patching includes Type C and D patching as described in the “Standard Specification for Construction Projects”.

INSPECTION – Road Patrols

1. During routine inspections or as situations arise, the Supervisor shall record deficiencies, post warning signs, schedule repairs and report as specified in the following “Standard” section.

2. The Supervisor shall provide the Area Manager with a prioritized list of road sections that frequently exhibit the conditions as specified in the following “Standard” section. This list shall be included in the “Annual Condition Defects Report”.

STANDARD

1. Spreader Patching

   When planning work or establishing priority lists for asphalt spreader patching the following types of defects shall be considered:

   - Large concentration of small potholes.

- Segregation/Raveling: Pavement material loss leaving voids in the surface.
- Wheel rutting: A longitudinal surface depression developed in the wheel tracks exceeding 20 mm.
- Rippling: Wavy or washboard effect running across the pavement.
- Cracking: Includes longitudinal, transverse, alligator and edge cracks.
- Edge loss: Loss of pavement surface adjacent to the shoulder.
- Aprons: Asphalt placed at the intersection of paved and gravel roads.
- Distortions: Any deviation of the pavement surface from its original shape.
- Flushing: Pavement surface appears polished or asphalt cement appears on the pavement surface.
- Water ponding: Collection of water on the travelled portion of the highway.
- Repairs around various structures including catch basins, manholes, bridge approaches and bridge drains.

2. Asphalt Gutter Installation

The Supervisor shall note gutter defects that prevent the movement of water including deteriorated asphalt, loss of shape, cracking, worn edges, and excessive gaps between the gutter and the edge of pavement.

Replacement or additional installations of asphalt gutter shall be determined by the Supervisor.

RESOURCES

This work is normally contracted out.

NORMAL PRACTICE

Perform spreader patching as per the contract specifications.

METHOD OF MEASUREMENT

Tonne of asphalt mix

NORMAL OUTPUT

Up to 800-2000 tonne per day

DEFINITION

Damage to Department infrastructure caused by severe weather conditions and/or a natural disaster.

PURPOSE

To repair and/or restore Department infrastructure to pre-storm conditions and preserve public safety during and after the event where possible.

GENERAL

Work under this activity shall include all labor, equipment and materials and contracted services used for clean-up, repair and public protection as a result of severe weather conditions and/or a natural disaster.

The Department shall assist the applicable Emergency Measures Organization as required.

This activity type can only be used with the approval of the District Director.

INSPECTION – Road Patrols

After a major severe storm, the Supervisor shall inspect all roads to identify storm damage. All damage shall be noted and submitted to the Area Manager as soon as possible. Please refer to “Storm Damage Expenditure Recording and Reporting” in “Manual 23” for specific guidelines and requirements for assessments and documentation.

STANDARD

The work shall be carried out as per the various activity type instructions.

The recording of pre-repair conditions as well as all expenditures and post repair conditions shall be tracked as “Storm Damage Expenditure Recording and Reporting” in “Manual 23”.

RESOURCES

All available and necessary equipment, labor, and material shall be made available to mitigate the effect of storm damage.

NORMAL PRACTICE

- Assess the extent of the damage and place signs/protection as required.
- Document damages as per “Storm Damage Expenditure Recording and Reporting” in “Manual 23”.
- Perform required work with all precautions taken in normal roadwork situations related to the activity being performed.

METHOD OF MEASUREMENT

All person hours, equipment hours, rentals, material costs, and contracted work are to be recorded under “Activity Type 145, Storm Damage”.

NORMAL OUTPUT

Not applicable

DEFINITION

Work under this Activity shall be any work NOT defined in any other Activity of these "Maintenance Standards"

PURPOSE

"Activity Type 199, Unclassified Maintenance" is to only be used when no other Activity Type describes the work being performed. The Area Manager shall be informed of charges to "Activity Type 199, Unclassified Maintenance".

GENERAL

Work under this Activity may include any minor clean up or other work related to motor vehicle accidents when the total Department billing cost does not exceed $200.

INSPECTION – Road Patrols

When work is encountered that is not defined in any other Activity of these "Maintenance Standards", "Activity Type 199, Unclassified Maintenance" may be used.

STANDARD

Not Applicable

RESOURCES

The labour required

NORMAL PRACTICE

Perform the necessary work

METHOD OF MEASUREMENT

All person hours are to be recorded under “Activity Type 199, Unclassified Maintenance”.

NORMAL OUTPUT

Not applicable

GENERAL

The objective of highway roadside maintenance shall be to provide safe sight distances for the traveling public. Grass, weeds and brush must be cut when they reduce visibility to features such as signs, intersecting roads and driveways. The general appearance of the roadside right-of-way shall be maintained in a safe and aesthetically acceptable condition as described in these “Maintenance Standards”.

The following “Maintenance Standards” outline the requirements for maintenance operations by the Supervisor. These standards are set out in various components, which make up the highway roadside system within the limits of right-of-way.

Activity Type 114	Brush Cutting – Machine
Activity Type 155	Brush Cutting – Manual
Activity Type 115	Mowing – Machine
Activity Type 156	Mowing – Manual
Activity Type 116	Debris & Litter Clean Up
Activity Type 194	Seeding
Activity Type 195	Weed Control

DEFINITION

The removal of large quantities of brush, shrubs and small trees using mechanically self-propelled equipment.

PURPOSE

To remove undesirable roadside vegetation in order to maintain required sight distances, control roadside growth, ensure proper drainage, and to provide a reasonably neat appearance to the highway right-of-way.

GENERAL

All brush shall be disposed of properly. This shall include the removal, mulching or chipping to achieve a reasonable neat appearance to the highway right-of-way.

Where traffic, pedestrians, housing or other obstructions prohibit the use of certain mechanical equipment, vegetation control shall be achieved with the use of manual hand cutting tools.

INSPECTION

During routine inspections or as situations arise, the Supervisor shall record deficiencies, schedule repairs and report as specified in the following “Standard” section. The Supervisor shall provide the Area Manager with a prioritized list of road sections which exhibit the conditions as specified in the “Standard” section, subsection 1.3 only. This list shall be included in the “Annual Condition Defects Report”.

STANDARD

1.0 Brush Cutting

1.1 When detected, brush (including tree branches) that reduce sight visibility as indicated in the “Minimum Sight Distance Table” below shall be cut within 21 days to a height of not greater than 150 mm from the ground. This shall include such areas as intersections, entrances, interchanges, and shoulders where the vegetation is infringing on guard rails and inside

of curves. If the actual sight distance (as measured in the field) indicates a corresponding speed that is 20 km/h or greater below the posted speed limit, the Supervisor shall correct the condition immediately.

Minimum Site Distance Table

Posted Speed (km/h)	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**
Minimum Stopping Sight Distance (m)	45	65	85	110	140	170	200	230
Minimum Passing Sight Distance (m)	-	160	200	240	275	330	400	475

(Sight distance measurements based on eye height of 1.05 m)

1.2 When detected, brush (including trees) on the right-of-way that create one or all of the following conditions, shall either be cut within 21 days, or if the condition poses a serious hazard shall be cut immediately.

1.2.1 Brush that obstructs traffic signs, destination signs, or traffic signs.

1.2.2 Brush (including tree branches) that restricts vertical clearances.

1.2.3 Brush within the shoulder area which restricts passing site distance.

1.3 Locations to be cut by Machine Brush Cutting shall be determined by the Supervisor based on the Department's "Brush Cutting Policy", "Manual 23, PR5039" and/or as indicated in the "Minimum Sight Distance Table" above. This work shall consist of cutting brush within the highway right-of-way, which shall include but is not limited to selected areas such as embankment slopes, ditches and back slopes. Only large sections of

planned machine brush cutting (estimated cost greater than $5,000) shall be included in the "Annual Conditions Defect Report".

RESOURCES

Equipment: Tractor with a mower attachment or
Grader with a brush cutter or
Excavator with a brush cutter
Attenuator (if required)

Labour: 1-2 operators
Traffic control person (as required)

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices.
- Cut brush as required.

METHOD OF MEASUREMENT

Hectares (1 Ha = 10,000 metres squared)

NORMAL OUTPUT

0.8 - 2.0 hectares per day

DEFINITION

The removal of brush, shrubs and other vegetation from localized areas using hand tools where mechanically self propelled equipment is not practical.

PURPOSE

To remove undesirable roadside vegetation in order to maintain required sight distances, control roadside growth, ensure proper drainage and to provide a reasonably neat appearance to the highway right-of-way.

GENERAL

All brush cut by hand shall be disposed of properly. This shall include the removal, mulching or chipping to achieve a reasonably neat appearance to the highway right-of-way.

INSPECTION

During routine inspections or as situations arise, the Supervisor shall record deficiencies, schedule repairs and report as specified in the “Standard” section.

The Supervisor shall provide the Area Manager with a prioritized list of road sections that exhibit the conditions as specified in the “Standard” section, subsections 1.3 and 2.0 only. This list shall be included in the “Annual Condition Defects Report”.

STANDARD

1. Brush Cutting

    1.1 When detected, brush (including tree branches) that reduce sight visibility as indicated in the “Minimum Sight Distance Table” below shall be cut within 21 days to a height of not greater than 150 mm from the ground. This shall include intersections, entrances, interchanges, shoulders, guard rails and inside of curves where the vegetation is infringing on minimum site distance. If the actual sight distance (as measured in the field) indicates a speed restriction that is ≥ 20 km/h below the posted speed

limit, the Supervisor shall correct the condition immediately.

Minimum Site Distance Table

Posted Speed (km/h)	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**
Minimum Stopping Sight Distance (m)	45	65	85	110	140	170	200	230
Minimum Passing Sight Distance (m)	-	160	200	240	275	330	400	475

(Sight distance measurements based on eye height of 1.05 m)

1.2 When detected, brush (including trees) on the right-of-way that creates one or all of the following conditions shall be cut within 21 days, or if the condition poses a serious hazard, immediately:

1.2.1 Brush which obstructs traffic signs, destination signs, or traffic signals.

1.2.2 Brush (including tree branches) which restricts vertical clearances.

1.2.3 Brush within the shoulder area which restricts passing site distance.

1.3 Locations to be cut by Machine Brush Cutting shall be determined by the Supervisor based on the Department's "Brush Cutting Policy", Manual 23, Policy PR5039 and as indicated in the "Minimum Sight Distance Table" above. This work shall consist of cutting brush within the highway right-of-way, which shall include but is not limited to selected areas such as embankment slopes, ditches and back slopes. Only large sections of planned manual brush cutting (estimated cost greater than $5,000) shall

be included in the “Annual Conditions Defects Report”.

2. Tree Removal

Trees that are old, dying, diseased, weakened, undermined or unsound and represent a threat to private property, traffic or pedestrians shall be removed. Hazardous trees scheduled for removal shall be included in the “Annual Conditions Defect Report”.

RESOURCES

Equipment: Various hand tools: axe, brush hook, power saw

Labour: 2-4 crew persons
Traffic control person (as required)

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices.
- Cut designated brush/ tress as required.

METHOD OF MEASUREMENT

Square meters per day

NORMAL OUTPUT

2000-8000 square meters per day

DEFINITION

Mowing is the process of controlling the growth of the grass, brush and weeds within the highway right-of-way by using mechanical and/or hand mowing equipment.

PURPOSE

The control of unwanted vegetation growth is required:

- To maintain required sight distance at curves and intersections.
- To ensure proper drainage at channels, ditches, etc.
- To define the road side for safety purposes and to create a reasonably neat appearance of the highway right-of-way.

GENERAL

Areas to be mowed include shoulders, side slopes, medians, traffic island and boulevards. Where traffic, pedestrians, housing or obstruction prohibit the use of certain mechanical equipment, mowing may be achieved with the use of manual cutting tools.

INSPECTION

During routine inspections or as situation arise, the Supervisor shall record deficiencies and schedule repairs as specified in the following “Standard” section.

STANDARD

1. Mowing (Manual or Machine)

    1.1 For all Level 1A and selected Level 1B Highways, the Supervisor shall follow the Department’s policy entitled “Maintenance Mowing Plan for 100 Series Divided Highways” in “Manual 23, PR5023”.

1.2 For all other Level 1B, Level 2 highways where vegetation will exceed 300 mm in height, mowing of roadside vegetation shall be carried out yearly.

The width to be mowed shall be from the edge of pavement to the back or end of the shoulder rounding.

1.3 For all Level 3 and Level 4 roads, mowing of roadside vegetation shall be carried out at the discretion of the Supervisor.

1.4 For all levels of roads within urban areas, grass shall be maintained to a height of less than 200 mm at all times for raised curbed medians, intersection islands and boulevards.

RESOURCES

Machine mowing:

Equipment: Tractor and rotary mower
Attenuator (as required)
Tractor and bar mower

Labour: 1-2 operators

Hand mowing:

Equipment: Push type mowers
Grass whips, scythe

Labour: 2-4 crew persons

Traffic Control: (as required)

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices.
- Mow vegetation as required.

METHOD OF MEASUREMENT

Machine: hectares (1 Ha = 10,000 square metres)

Hand: square metres

NORMAL OUTPUT

Machine: 0.5-3 hectares per day

Hand: 1000-3000 square metres per day

DEFINITION

The physical removal from the right-of-way and the subsequent disposal of objectionable items such as, but not limited to roadside rubbish, dead animals, unlawful signs, fallen trees, and loose brush. Includes fallen rocks on the driving surface and shoulders.

PURPOSE

Debris and Litter Clean-up acts as a precaution against damage or injury to the travelling public and personnel or equipment engaged in maintenance operations.

GENERAL

All debris shall be removed from the right-of-way and disposed of according to department policy and current governmental and municipal regulations.

All dead animals on the travelled portion and shoulder area of the right-of-way shall be removed and disposed of properly. In areas where a dead animal could create a health hazard, it shall be removed and disposed of immediately.

The Supervisor shall notify the Department of Natural Resources (DNR) of all dead large game animals (i.e. deer) cleared from the roadway surface or those detected beyond the shoulder. As the DNR may wish to retrieve the animal, the Supervisor shall cooperate fully to arrange a mutually agreed upon pick-up location.

INSPECTION

During routine inspections or as situations arise, the Supervisor shall record deficiencies, post warning signs, schedule work and report as specified in the following “Conditions” section.

The Supervisor shall provide the Area Manager with a prioritized list of road sections that frequently exhibit the conditions as specified in the “Conditions” section, subsection (B) only. This list shall be included in the “Annual Condition Defects Report” submitted.

After winter operations are completed, early spring inspections are to be carried out to check for additional Condition Defects. The Area Manager is to be advised if changes are required to the annual report.

STANDARD

1. Debris Control

1.1 The Supervisor shall be responsible for removing and disposing of all debris and litter on the highway right-of-way as outlined below in the "Debris and Litter Clean-up Criteria Table". For object volumes specified, the Supervisor shall remove debris within the specified time limit.

Debris and Litter Clean-up Criteria Table

Debris Control	Level 1A	Level 1B	Level 2	Level 3 Local Roads	Level 4 Gravel Roads
Paved Surface	Immediately	Immediately	Immediately	Immediately	Full width gravel surface: Greater than 0.01m^3 Immediately
Non-Paved Shoulder	Greater than 0.03 m^3 Within 12 hrs	Greater than 0.03 m^3 Within 24 hrs	Greater than 0.03 m^3 Within 36 hrs	Greater than 0.03 m^3 Within 72 hrs	
Beyond Shoulder	Greater than 0.4 m^3 yearly before Nov. 30	Greater than 0.4 m^3 yearly before Nov. 30	Greater than 0.4 m^3 yearly before Nov. 30	Greater than 0.4 m^3 yearly before Nov. 30	Between 0.4 m^3 and 3.0 m^3 yearly before Nov. 30

The following examples clarify object sizes listed in the above table:

0.01 m^3 = 0.3 m x 0.3 m x 0.1 m (or 12" x 12" x 4")
0.03 m^3 = 0.3 m x 0.3 m x 0.3 m (or 12" x 12" x 12")
0.4 m^3 = 0.75 m x 0.75 m x 0.70 m (or 30" x 30" x 28")
0.4 m^3 = 1.0 m x 1.0 m x 0.4 m (or 39: x 39" x 16")

2. Additional Debris and Litter Clean-up

Any routine removal work not governed by the criteria in the “Debris and Litter Clean-up Criteria Table” shall be undertaken during daily maintenance activities when in the vicinity of the work.

Any major removal work not governed by the criteria in the “Debris and Litter Clean-up Criteria Table” shall be undertaken as required.

RESOURCES

Equipment: Mechanical lifting device, if required
Shovels

Labour: 1-2 division crew person(s)

Materials: N/A

METHOD OF MEASUREMENT

Manhours

NORMAL OUTPUT

N/A

DEFINITION

This operation consists of seeding a grass mixture to the highway right-of-way by mechanical or manual means.

PURPOSE

To provide a vegetation cover on highway right-of way to control erosion, weed growth and to provide a pleasing appearance.

GENERAL

Hydro-seeding shall be carried out in accordance with “Hydro-seeding” in of the Department’s “Highway Construction and Maintenance Standard Specifications”, Chapter 7 Section 5.

INSPECTION

During routine inspections or as situations arise, the Supervisor shall record deficiencies and schedule repairs as specified in the following “Standard” section.

STANDARD

All areas disturbed by ditching or any other maintenance operations will be seeded in order to avoid erosion as outlined in the Department’s “Maintenance Ditching Guidelines”.

RESOURCES

Equipment: Hydro-seeder
Hand seeder

Labour**:** 0-1 operator
0-1 labourer
Traffic control (as required)

Materials: Grass seed
Topsoil and mulch

NORMAL PRACTICES

- Seed areas of Highway right-of-way affected by ditching or repair work with a hydro-seed mix as detailed in the Department's "Standard Specifications", Chapter 7 Section 5.
- Seed the grass mixture at a rate of 20 to 40 Kg/Ha.
- Re-seed as required.

METHOD OF MEASUREMENT

Square metres

NORMAL OUTPUT

1000 to 7000 square metres per day

DEFINITION

To control the growth of weeds and unwanted vegetation through the use of herbicides or any other organic products.

PURPOSE

The control of weeds and unwanted vegetation is required to:

- Maintain required sight distance at curves and intersections.
- Ensure proper drainage at channels, ditches, etc.
- Control the spread of noxious weeds.
- Define the road side for safety purposes and to create a reasonably neat appearance of the highway.

GENERAL

The Supervisor will have the option to control weeds by spraying and must obtain approval from DOE prior to commencing any work.

The Supervisor will follow all department policies and guidelines, government and municipal acts and regulations and obtain all necessary permits pertaining to the use of herbicides for weed control.

INSPECTION

During routine inspections or as situations arise, the Supervisor will record deficiencies and schedule repairs as specified in the following “Standard” section.

STANDARD

Refer to the “Integrated Roadside Vegetation Manual” developed for TIR.

RESOURCES

Equipment: Mechanical spray equipment

Labour: 1-2 division crew person(s)

Materials: Various herbicides

METHOD OF MEASUREMENT

Hectares (1 Ha = 10,000 square metres)

NORMAL OUTPUT

20 Hectares per day

GENERAL 1

A highway drainage system is designed to transfer and remove water from the highway and other areas and to intercept, transfer and dispose of surface water flowing towards the road. The system is also designed to prevent excess moisture from entering and damaging the granular base and sub-base courses, causing premature surface failure.

The following "Maintenance Standards" outline the requirements for maintenance operations by the Supervisor.

These standards are set out in various components, which make up the highway drainage system within the limits of the right-of-way.

Activity Type 117	Grader Ditching
Activity Type 118	Ditching
Activity Type 142	Culvert Installation - Concrete
Activity Type 143	Culvert Installation - Driveway
Activity Type 144	Culvert Installation - Roadway
Activity Type 146	Catch Basin Installation
Activity Type 147	Catch Basin Maintenance
Activity Type 151	Storm Sewer Maintenance
Activity Type 152	Storm Sewer Installation
Activity Type 158	Culvert Maintenance

GENERAL 2

1. The Area Manager shall be notified if proposed work may potentially change the design of an existing facility, such as listed below:
   - Add, relocate or abandon an outfall or ditch.
   - Significantly modify the cross-section or grade line of a ditch, culvert or sewer
   - Replace the lining of a ditch with a different type (i.e. replace grass with rip rap).

2. The Supervisor is responsible for removing all drainage obstructions within the right-of-way. The work of removing obstructions shall be completed to ensure the volume of water released will not cause flash flooding. The Supervisor shall lower the water to a safe level, before removing the obstructions. The Area Manager shall be notified of any problems identified outside the right-of-way limits.

3. The Supervisor shall record any recurring problems originating with municipal or privately owned drainage systems or impacting on private property and refer them

to the Area Manager.

4. The Supervisor is responsible for obtaining all appropriate government approvals and following all By-Laws, Acts, Regulations and Departmental Policies.

5. The supervisor is responsible for all aspects of beaver control, including removing dams. All work to control beavers shall follow the TIR Manual Procedure - PR5097 Removing Beaver Dams, January 2010.

DEFINITION

Grader ditching is the cutting, cleaning or shaping of roadside ditches on low volume gravel roads using a grader.

PURPOSE

The purpose of grader ditching is to establish a channel to convey water away from the gravel road surface and/or to intercept water before it reaches the road. Grader ditching is also used to allow free drainage of the road bed.

GENERAL

The Supervisor will evaluate and choose the most cost effective and efficient method to ditch. Factors to consider are the length and volume of flow as well as discharge/culvert locations.

Grader ditching includes installing, maintaining or removing sediment control devices. Also includes hand seeding/mulching.

INSPECTION

During routine inspections or as situations arise, the Supervisor will identify areas that would benefit from grader ditching and schedule repairs.

STANDARD

On low volume gravel roads where drainage problems exist (i.e. where water free flows on the road surface or there is no ditch), grader ditching may be performed.

RESOURCES

Equipment: Grader

Labour: 1 operator
0-1 crew person
Traffic control persons (as required)

Materials: Clear stone (flow checks) (as required)
Seed

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices, if required.
- Remove large rocks and debris before making initial pass.
- Clean up unwanted windrow of discharged material.
- Reshape roadbed and back slope.
- Install appropriate environmental controls/seed as required.

METHOD OF MEASUREMENT

Lineal metres

NORMAL OUTPUT

From 100 to 1000 lineal metres per day

DEFINITION

Maintenance ditching is defined as the correction of the grade of existing ditches or increasing the capacity of the ditch. Ditching is the cutting, cleaning or re-shaping of ditches using boom-type equipment such as excavators or backhoes.

PURPOSE

The purpose of ditching is to establish a channel to convey water away from the road surface and/or to intercept water before it reaches the road. Ditching is also used to allow free drainage of the road bed.

GENERAL

Ditching includes maintaining all roadside and drainage ditches including watercourse inlets and outlets, easements, medians and side and back slopes of embankments.

Ditching includes installing, maintaining or removing sediment control devices. Also includes hand seeding/mulching.

INSPECTION

During routine inspections or as situations arise, the Supervisor will record deficiencies and schedule work.

All large sections of planned ditching greater than 500 metres in length and areas of troublesome erosion or severe erosion over 100 square metres will be prioritized by the Supervisor and provided to the Area Manager on the “Annual Condition Defects Report”.

STANDARD

1. Maintenance

   Ditches will be maintained to facilitate the efficient movement of water and to ensure that the functional capacity is maintained to accommodate peak flows. Ditches will be cleaned as required, before September 30th to ensure that any deficiencies are addressed that constitute or have the potential to create an

unsafe condition to the travelling public, adjacent properties, or represent a threat to the highway infrastructure.

Obstructions that are causing significant damage to the ditch, roadbed, shoulders, adjacent properties or which pose an unsafe condition to the travelling public will be removed immediately.

All areas affected by ditching operations shall be protected from erosion.

2. Erosion and Sediment Control

The Supervisor will be responsible for maintaining ditches (including side slopes, back slopes and slope protection) from erosion. When severe erosion occurs, the Supervisor will be responsible for repairing the eroded areas. Areas less than 100 square metres must be repaired within 30 days, including stabilization or the establishment of vegetation ground cover.

Any observations of severe erosion over 100 square metres in area or continuously troublesome sections are to be repaired in consultation with the Area Manager.

The Supervisor will take immediate action to prevent sediment from entering any downstream watercourse, wetland, or environmentally sensitive areas, in accordance with all government acts and regulations.

RESOURCES

Equipment: Backhoe and/or excavator
1-3 tandem or single axle trucks
Hand tools (shovel)

Labour: 1-4 operators
0-1 crew persons
Traffic control persons (as required)

Materials: Clear stone (flow check) (as required)
Seed

NORMAL PRACTICE

- Complete hazard assessment.
- Obtain Disposal of Surplus Material release form and location to dump waste.
- Set up temporary signing and traffic control devices, as required.
- Ditch from the lowest elevation to the highest.
- Install flow checks as required.
- Seed as required.

METHOD OF MEASUREMENT

Lineal metres (excluding the length of culverts)

NORMAL OUTPUT

400-1000 lineal metres per day

DEFINITION

Installation or replacement of culverts (≤ 3 metre diameter) which have failed or are beyond repair.

PURPOSE

The purpose of culvert installation is to provide an opening under a roadway, railway or driveway to allow the movement of water, livestock, or pedestrians.

GENERAL

Culvert installation work shall be recorded using the following Activity types:

- "Activity Type 142, Culvert Installation" - concrete (use for all concrete pipe work)
- "Activity Type 143, Culvert Installation" - driveway (use for all wood, corrugated or polyethylene pipe in a driveway application)
- "Activity Type 144, Culvert Installation" - roadway (use for all corrugated or PE pipe under a roadway)

The Supervisor shall be limited to installing only the type of pipe listed in the "Culvert Material Options Table" below.

Culvert Material Options Table

Culvert Type [1]	Road Classification			
	100 Series	**Trunks**	**Routes**	**Local Road Gravel & Paved Surface**
Reinforced Concrete Pipe	Yes	Yes	Yes	Yes
Corrugated Aluminum Alloy Pipe	No	No	Yes	Yes
High Density Polyethylene Pipe (double walled) (HDPE)	No	No	Yes	Yes [3]
Corrugated Aluminized Steel Pipe	No	No	No	Yes [2]

[1] *Culverts can be used as cross culverts and/or driveway culverts*

[2] *The PH of the water shall be between 5 and 9*

[3] *On gravel roads, polyethylene pipe shall only be an option on LOW VOLUME roads when 300 mm of cover is ensured. Proper installation is critical; backfill material shall be Type 1 granular material and compacted to 100% maximum dry density. Bedding is recommended at 100 mm to 150 mm of compacted Type1 granular material.*

The Supervisor shall obtain all necessary environmental approvals prior to commencing any work involving brooks, streams, rivers or fish habitat.

INSPECTION

During routine inspections or as situations arise, the Supervisor shall record deficiencies, post warning signs and schedule repairs as specified in the following Standard section.

The Supervisor shall provide the Area Manager with a prioritized list of all cross culverts that have deteriorated and require replacement. This list shall also include any drainage problems that may require new culvert installation. This list shall be included in the “Annual Condition Defects Report”.

STANDARD

Culvert Installation

Any culverts that have failed, are not functioning properly, are causing damage to the roadway or are a hazard will be immediately signed/protected and repaired or replaced as soon as possible,

When detected, any culverts that have been deemed as being **beyond repair will be prioritized for replacement as funding allows.**

All culvert installation work shall be completed yearly before September 30th.

Culverts greater than 800 mm in diameter shall be replaced in consultation with the Area Manager.

RESOURCES

Equipment: Backhoe or excavator
Tandem or single axle trucks with tag
Compactor (Tamper)
Hand tools (shovels, rakes)
Lifting device (chain, sling)

Labour: 2-3 operators
1-2 crew person(s)
Traffic control persons, as required

Materials**:** Culverts
Couplings and bolts
Granular materials
Rip rap

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices, as required.
- Excavate trench for new culvert, or remove damage culvert.
- Install new/replacement culverts and couplings if needed.
- Backfill with acceptable materials.
- Compact.
- Install rip rap.
- Add surface cover (Type 1 gravel, asphalt).

METHOD OF MEASUREMENT

Lineal metres of pipe installed as measured from inlet to outlet. The length of coupling devices shall not be added to the length of pipe.

Note: Reinstating asphalt surfaces above culverts shall be recorded under “Activity Type 132, Hand Patching” (Chapter 1 Section 7).

NORMAL OUTPUT

10 to 25 metres

DEFINITION

Installing new catch basins, manholes, ditch inlets, replacing existing catch basins, manholes, ditch inlets that have failed or are beyond repair.

PURPOSE

The purpose is to eliminate surface water from roadways by utilizing structures such as catch basins, manholes and ditch inlets.

GENERAL

A “catch basin” is a structure that acts as a receptacle or container to catch surface water and divert it to an underground drainage system.

A “ditch inlet” is a structure having an opening to allow run-off from a ditch to be carried to an outfall or storm sewer.

A “manhole” is a structure having an opening to provide access to underground services, in this case, storm water flow.

> **Warning:** Catch basins and manholes are “confined spaces”. Entry to a confined space must comply with pertinent legislated safety requirements.

INSPECTION

The Supervisor will provide the Area Manager with a prioritized list of all structures that have deteriorated or may fail and require replacement. This list will also include any drainage problems that may require new installations. This list will be included in the “Annual Condition Defects Report”.

STANDARD

As directed by the Area Manager, the Supervisor is responsible to install new structures or replace all existing structures that have been identified as being beyond repair.

Any structures that have failed and are causing damage to the roadway or are a hazard will be signed and/or protected and replaced or repaired immediately.

Note: Repairs will be done under "Activity 147, Catch Basin Maintenance".

RESOURCES

Equipment: Backhoe or excavator
1-3 tandem or single axle trucks with tag
Compactor (tamper)
Hand tools (shovels, rakes)
Lifting device (chain, sling)
Pump
Trenching safety devices, as required

Labour: 2-4 operators
2-4 crew persons
Traffic control persons, as required

Materials**:** Catch basins
Manhole covers
Granular material
Grout

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices, as required.
- Check with utilities/municipality for underground wires or lines.
- Excavate and install granular materials for bedding.
- Install catch basin, pipe (grout as required) and granular material.
- Backfill and compact.

METHOD OF MEASUREMENT

Each: number of manholes and catch basins

NORMAL OUTPUT

1-2 installations per day

DEFINITION

Catch basin maintenance includes cleaning of debris and materials from catch basins, manholes and ditch inlets. Also includes replacing catch basin and manhole frames and covers, ditch inlet grates, and structural repairs.

PURPOSE

The purpose is to facilitate the efficient movement of water and to ensure that the functional/structural capacity is maintained to accommodate peak flows and traffic demands.

GENERAL

Catch basins and ditch inlets will be cleaned/repaired as required to ensure that any potential deficiencies are addressed. These deficiencies may include unsafe conditions to the traveling public, flow restrictions, or impact to the highway infrastructure.

> **Warning:** Catch basins and manholes are “confined spaces”. Entry to a confined space must comply with pertinent legislated safety requirements.

INSPECTION

During routine inspections or as situations arise, the Supervisor will record deficiencies, post warning signs, schedule repairs and report as specified in the following “Standard” section.

The Supervisor shall provide the Area Manager with a prioritized list of structural repairs as described in the “Standard” section, subsection 3. This list shall be included in the “Annual Condition Defects Report”.

Before major storm events any catch basins, manholes and ditch inlets that have a history of flooding should be inspected and appropriate action taken.

STANDARD

1. Cleaning

A spring inspection of all structures will be completed as soon as practically possible after winter operations has ended. The Supervisor will be responsible for removing all debris from catch basins, manholes and ditch inlets every two (2) years or as required. This will be scheduled after sweeping operations have been completed.

All sumps shall be cleaned as required to maintain a minimum depth of 75 mm below the bottom of the outlet.

The Supervisor is responsible for removing debris from the ditch inlet grates that is restricting drainage flow as conditions dictate.

2. Replace Catch Basin or Manhole Cover

All missing or damaged catch basin and manhole covers shall be protected and signed immediately and replaced as soon as possible.

3. Repairs

Catch basin, manhole and ditch inlet defects including damaged or depressed frames that constitute or have the potential to create an unsafe condition to the traveling public or represent a threat to the highway infrastructure, will be repaired within 60 days.

Any structure with defects that are beyond repair or are not cost effective to repair, shall be replaced as defined by “Activity Type 146, Catch Basin Installation”.

RESOURCES

Equipment: Backhoe or excavator (as required)
Vacuum truck (as required)
Hand tools (shovels, rakes, brooms)
Jack hammer (as required)

Labour: 1-2 operators
1-2 crew persons
Traffic control persons (as required)

Materials: Catch basin frames
Covers and risers
Manhole frames
Grout, lumber, etc.

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices, as required.
- Remove debris.
- Carry out necessary repairs.

METHOD OF MEASUREMENT

Each

NORMAL OUTPUT

1-3 per day

DEFINITION

Storm sewer maintenance includes cleaning debris and materials from storm sewers including pipes and outfall structures. It also includes repairing structural defects and leaks in the system.

PURPOSE

To facilitate the movement of water and to ensure that the functional capacity is maintained to accommodate peak flows.

GENERAL

This system includes sewers, connections, junction chambers, laterals, manholes and outfall structures.

An "outfall" structure is constructed at a pipe outlet from a storm sewer system. This structure is to provide a transition between the pipe outlet and a watercourse and to prevent erosion at the outlet or in the outfall channel.

Storm sewers and outfall structures will be cleaned/repaired as required to ensure that any potential deficiencies are addressed. These deficiencies may include unsafe conditions to the traveling public, flow restrictions, or impact to the highway infrastructure.

INSPECTION

During routine inspections or as situations arise, the Supervisor will record deficiencies, post warning signs, schedule repairs and report as specified in the following “Standard” section.

The Supervisor will provide the Area Manager with a prioritized list of structural repairs as described in the “Standard” section, subsection 4. This list will be included in the “Annual Condition Defects Report”.

Before major storm events any storm sewer systems that have a history of flooding will be inspected and appropriate action taken.

STANDARD

1. Cleaning

   A spring inspection of all storm sewer systems will be completed as soon as practically possible after winter operations has ended. The Supervisor will be responsible for removing all debris from storm sewer system every two (2) years or as required. This will be scheduled after sweeping operations have been completed. The Supervisor is responsible for removing debris from any part of a storm sewer system that is restricting drainage flow as conditions dictate.

2. Erosion

   The Supervisor is responsible to repair all undermining of pipe, outfall structures, and ditch erosion within 5 m of the end of the pipe, and removal of obstructions that are reducing the flow capacity, that constitute or have the potential to create an unsafe condition to the traveling public or represent a threat to the highway infrastructure will be repaired within 60 days.

3. Repairs

   Storm sewer defects that constitute or have the potential to create an unsafe condition to the traveling public or represent a threat to the highway infrastructure will be repaired within 60 days.

   Any storm sewers with defects that are beyond repair or are not cost effective to repair, shall be replaced as defined by “Activity Type 152, Storm Sewer Installation”.

RESOURCES

Equipment: Backhoe or excavator
Tandem or single axle truck
Vacuum truck
Hand tools (shovels, rakes)
Lifting device (chain, sling)

Labour: 1-2 operators
1-2 crew persons
Traffic control persons (as required)

Materials**:** Grout
Granular material

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices, as required.
- Excavate as required.
- Remove debris.
- Carry out necessary repairs.
- Backfill as required.

METHOD OF MEASUREMENT

Lineal metre of storm sewer maintained.

Note: Does not include work to catch basins, manholes or ditch inlets as defined by "Activity Type 147, Catch Basin Maintenance".

NORMAL OUTPUT

50 to 200 lineal metres per day

DEFINITION

Storm sewer installation includes installing new storm sewer piping including outfall structures or replacing existing storm sewers that have failed or are beyond repair as defined by “Activity Type 151, Storm Sewer Maintenance”.

PURPOSE

To carry storm water runoff collected through gutters, ditch inlets, and catch basins, to an outfall.

GENERAL

This system includes sewers, connections, junction chambers, laterals, manholes and outfall structures.

An "outfall" structure is constructed at a pipe outlet from a storm sewer system. This structure is to provide a transition between the pipe outlet and a watercourse and to prevent erosion at the outlet or in the outfall channel.

Warning:	Storm sewers are "confined spaces". Entry to a confined space must comply with pertinent legislated safety requirements.

INSPECTION

The Supervisor will provide the Area Manager with a prioritized list of all storm sewers that have deteriorated and require replacement. This list will also include any drainage problems that may require new installations. This list will be included in the “Annual Condition Defects Report”.

STANDARD

As directed by the Area Manager, the Supervisor is responsible to install any new storm sewer or replace all existing storm sewers that have been identified as being beyond repair.

Any storm sewers that have failed and are causing damage to the roadway or are a hazard will be signed and/or protected and replaced immediately.

RESOURCES

Equipment: Backhoe or excavator
Tandem or single truck with tag
Compactor (tamper)
Hand tools (shovels, rakes)
Lifting device (chain, sling)
Pump
Trenching safety devices

Labour: 2 operators
1-3 crew person
Traffic control persons (as required)

Materials**:** Pipe
Granular materials

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices, if required.
- Check with utilities and Municipality for underground wires or lines.
- Excavate and install granular materials for bedding.
- Install pipe and granular material.
- Backfill with acceptable material and compact trench.

METHOD OF MEASUREMENT

Lineal metres of pipe installed.

Note: Any installation of catch basins, manholes or ditch inlets shall be recorded under "Activity Type 146, Catch Basin Installation".

NORMAL OUTPUT

20 to 50 lineal metres per day

DEFINITION

Culvert maintenance includes repairing existing culverts, cleaning ends or complete lengths, repairs to rip rap, excavation, backfill and surface gravel. Also includes any ditching work within 3m of each end of the culvert.

PURPOSE

The purpose is to facilitate the efficient movement of water and to ensure that the functional/structural capacity is maintained to accommodate peak flows and traffic demands.

GENERAL

A culvert is a structure designed to provide an opening under a roadway, railway or side entrance, to allow the movement of water, livestock or pedestrians. A culvert may be constructed of concrete, corrugated metal, treated wood or polyethylene pipe (PE). The Area Manager shall provide a copy of all Building, Entrance and Work Within Highway Right-of-Way Permits to the Supervisor. The Supervisor shall be responsible to ensure proper driveway installation, in accordance with the permits.

When the Supervisor is unable to clear blocked culverts by conventional means (such as high pressure water flushing), the culvert shall be replaced as defined under Culvert Installation – “Activity #142” Concrete Culverts, “Activity #143” Driveway Culverts and “Activity #144” Roadway Culverts.

The Supervisor is responsible for timely repair of all entrance and cross culverts that have failed or may fail or are not functioning properly as defined under Culvert Installation – “Activity #142” Concrete Culverts, “Activity #143” Driveway Culverts and “Activity #144” Roadway Culverts.

INSPECTION

During routine inspections or as situations arise; the Supervisor shall record deficiencies, post warning signs, and schedule repairs as specified in the following Conditions section.

STANDARD

1. Culvert Cleaning

   Existing drainage structures will be maintained to facilitate the efficient movement of water and to ensure that the functional capacity is maintained to accommodate peak flows.

   When detected, all culverts that constitute or have the potential to create an unsafe condition to the traveling public, adjacent properties, or represent a threat to the highway infrastructure, will be cleaned as required, before October 31.

   Obstructions that are causing significant damage to the culvert, ditch, roadbed, shoulders, adjacent properties or pose an unsafe condition to the traveling public shall be removed immediately.

   Check bars or grids, which have been installed to prevent unauthorized entry, to ensure they are in place and secure. Damaged bars or grids shall be repaired.

   Culvert inlets with bars and grids installed shall be monitored frequently to ensure that debris does not accumulate and cause flooding. Any debris that is restricting drainage flow shall be removed immediately.

2. Culvert End Washouts (Rip Rap)

   When detected, hand laid or grouted rip-rap around culvert ends shall be repaired or any material that has been lost or displaced by erosion or scouring replaced within 60 days.

3. Culvert Repairs

   Any severe defects not outlined in this Conditions Section shall be reported immediately to the Area Manager.

RESOURCES

Equipment: Backhoe or excavator (as required)
Vacuum truck (as required)
Hand tools (shovels, rakes, brooms)
Jack hammer (as required)

Labour: 1-2 operators
1-2 crew persons
Traffic control persons (as required)

Materials: As required

NORMAL PRACTICE

- Complete hazard assessment
- Set up temporary signing and traffic control devices, as required
- Remove debris, if required
- Carry out necessary repairs

METHOD OF MEASUREMENT

Each culvert, regardless of length

NORMAL OUTPUT

1-3 per day

GENERAL

Traffic control devices inform the user of traffic regulations, warn of roadway characteristics and road hazards, and provide information necessary for route selection. These devices consist of signs, pavement markings, guard rails and jersey barriers.

The following Maintenance Standard outlines the requirements for Maintenance operations by the Supervisor.

These standards are set out in various components, which make up the highway traffic control system within the limits of the right-of-way.

Activity Type 131	Jersey Barrier Maintenance
Activity Type 133	Sign Maintenance and Repair
Activity Type 134	Sign Installation
Activity Type 135	Pavement Markings
Activity Type 136	Traffic Line Painting
Activity Type 164	Guide Post Maintenance
Activity Type 165	Guide Post Installation
Activity Type 166	Guard Rail Maintenance
Activity Type 167	Guard Rail Installation

DEFINITION

Repairing the jersey barriers for minor defects, replacing reflectors and replacement of barrier sections deemed beyond repair.

PURPOSE

To ensure the structural integrity and functionality of the jersey barrier.

GENERAL

Concrete Jersey barriers are engineered devices designed to deflect or restrain vehicles from crossing over into oncoming traffic and to protect motorists from roadside hazards.

INSPECTION – Road Patrols

During routine inspections or as situations arise the Supervisor shall inspect the concrete barriers for deficiencies, post warning signs, schedule work and report in the "Annual Condition Defect Report" to the Area Manager.

All reflectors mounted on the jersey barriers shall be inspected by the Supervisor and replaced where necessary on a yearly basis prior to November 30th.

STANDARD

The Supervisor shall secure any "breakouts" within 24 hours of the barrier being damaged by fastening steel guardrail channels to sound concrete on either side, installing pre-cast jersey barrier(s) sections, or by other methods approved by the Area Manager.

Emergency safety precautions (barricades, safety drums etc.) are to be taken immediately by the Supervisor, when notified, to ensure the safety of the traveling public.

RESOURCES

Equipment: Service truck or truck and tag, if required
Excavator or backhoe or boom truck for lifting, if required
Attenuator, if required
Jack hammer, compressor, drills, etc., as required

Labour: 1-3 operators
2-5 crew persons
Traffic control, as required

Materials: Guardrail, delineators, grout, barrier sections, etc. depending on the nature of the repair

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices, as required.
- Carry out necessary repairs.

METHOD OF MEASUREMENT

Lineal metres

Reflector replacements are recorded as the total length of barrier serviced or the length of lane closure as the accomplishment length.

NORMAL OUTPUT

Varies according to the nature of work.

DEFINITION

Sign Maintenance and Repair is maintaining signs and posts, including repairing, repainting and washing of existing signs and posts. Includes replacing signs and/or posts missing or beyond repair.

Sign Installation is installing new signs and posts at a new location where no sign was previously in place.

PURPOSE

To ensure the integrity of the signs, to inform the highway users of traffic regulations, to warn of roadway characteristics, and to provide information necessary for route selection.

GENERAL

Signs are devices which may be regulatory, warning or informational and are installed or maintained to provide information and to ensure the safety of the traveling public along public highways. Signs are erected by the Supervisor where directed by the District Traffic Supervisor or Provincial Signing Officer on public highways. No permanent sign shall be installed at a new location or removed from its existing location without the approval from the Area Manager and District Traffic Authority.

The following signs shall be considered as **critical signs**:

- Stop
- Yield
- One Way
- Do Not Enter

Each Supervisor must have access to a current copy of the “Manual of Uniform Traffic Control Devices” for easy reference which they can refer to for sign classification, etc. “Manual 23, PR 5052, Guide Sign Installation at Intersections” provides guidelines for sign installations.

The Supervisor is responsible to have an adequate supply of regulatory and warning signs in stock at all times.

Signs are classified as follows:

1. Permanent Signs:

   Regulatory Signs: Advise the highway user of traffic regulations which apply at any time or place upon a highway as per the Public Highway Act.

   Warning Signs: Give advance notice of conditions upon or adjacent to a street or highway that are potentially hazardous to drivers.

   Information Signs: Provide information for destinations, selection of route, location of off-highway facilities, and for identification of geographical features or points of interest.

2. Temporary Conditions Signs

   Signs erected to warn highway users of conditions that last a short period of time (ie. Low Shoulder, Bump, Hazard Markers, etc.). The requirement for these signs is outlined in the "Manual of Uniform Traffic Control Devices". The signs are erected by the Supervisors.

INSPECTION – Road Patrols

During routine inspections or as situations arise, the Supervisor shall identify all illegible, poor reflectivity, improperly oriented, or missing signs and schedule work as specified in the "Standard" section.

Any signs greater than 3 square metres which require replacing shall be approved by the Area Manager prior to replacement.

STANDARD

1. Sign Maintenance and Repairs

   The Supervisor shall maintain and repair all signs, in accordance with the "Sign Work Response Time" table on next page.

Sign Maintenance and Repairs shall include, but is not limited to the following:

1.1 Repair or clean all signs that are illegible (i.e. mud covered, faded, poor reflectivity, bent, improperly oriented, twisted, vandalized, broken or cracked).

1.2 Replace all signs or posts that are missing or replace signs or posts that are beyond repair, bent, improperly oriented, twisted, broken or cracked.

1.3 Report all vandalized or stolen signs to the proper authority along with an estimate of cost to replace.

2. Sign Installation

Any new sign (including posts) that is installed at new locations as directed by the Area Manager and in consultation with the District Traffic Authority.

Sign Work Response Time

Response Times	Level 1A	Level 1B	Level 2	Level 3 & 4
Stop Signs (+ All Critical Signs)	Immediately	Immediately	Immediately	Immediately
Regulatory and Warning Signs	7 Days	14 Days	14 Days	21 Days
Information Signs less than 1 m^2	30 Days	60 Days	90 Days	90 Days
Information Signs greater than 1 m^2	60 Days	90 Days	90 Days	120 Days

RESOURCES

Equipment: Crew vehicle
Hand tools as required
Post hole digger

Labour: 1-3 crew person(s)

Materials: Sign posts

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices.
- Check with utilities/municipality for underground wires or lines.
- Install/repair sign and post.
- Ensure it is straight and level.

METHOD OF MEASUREMENT

"Activity 133, Sign Maintenance and Repair" – Each

"Activity 134, Sign Installation" – Each (including posts)

NORMAL OUTPUT

"Activity 133, Sign Maintenance and Repair" – 10-20 per day

"Activity 134, Sign Installation" – 3-5 per day

DEFINITION

Work under this activity shall include the application of pavement markings including directional arrows, stop bars, crosswalks, cross hatching, gore area markings, etc.

PURPOSE

To establish new markings or to re-establish markings that have worn as a result of traffic, weather, etc.

GENERAL

Pavement markings are traffic control devices applied to provincial highways to provide the safe and orderly movement of traffic. Pavement markings perform definite functions, by complimenting regulations and warnings by other devices such as traffic signs or signals.

Work under this activity shall be in accordance with the “Manual of Uniform Traffic Control Devices”, except as modified in these “Maintenance Standards”.

School crosswalks are included with pavement markings.

If Municipal crosswalks are painted by Department forces, these costs are a recoverable item see “Manual 23, P01005, Installation of Pedestrian Crosswalks”.

INSPECTION – Road Patrols

During routine inspections or as situations arise the Supervisor shall record deficiencies and schedule repairs specified as in the following “Standard” section.

STANDARD

1. Pavement Markings

   All pavement markings (including school crosswalks), shall be applied yearly, before August 31st.

2. Additional Pavement Markings

Additional pavement markings will be applied as directed by the District Traffic Authority.

RESOURCES

Equipment: Crew vehicle
Roller/sprayer
Templates

Labour: 3-4 crew persons
Traffic control as required

Materials: Paint
Glass beads

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices (as required).
- Do required painting.
- Apply glass beads while paint is wet.
- Allow paint to dry before allowing traffic on markings, if possible.

METHOD OF MEASUREMENT

Square metres

NORMAL OUTPUT

60-80 square metres per day

DEFINITION

Traffic line painting are control devices applied to paved Provincial highways to define the centre line divider, lane dividers and edge lines of the road way.

PURPOSE

Traffic lines perform definite functions for the safe and orderly movement of traffic.

GENERAL

Painting of centre line, lane dividers and edge lines are usually applied using automated paint truck.

INSPECTION – Road Patrols

Centre line markings in problem locations should be reviewed or verified to ensure compliance with the safe stopping sight distance requirements for the posted speed limits**.**

During routine inspections or as situations arise the Supervisor shall record deficiencies and schedule the repairs as specified in the "Standard" section**.**

STANDARD

Any changes in the existing centerline markings authorized by the District Traffic Supervisor shall be marked in the field PRIOR to May 31st.

All Level 1A highways shall have traffic lines painted PRIOR to July 31st.

All Level 1B and Level 2 highways shall have centre lines painted PRIOR to August 15th.

All Level 1B and Level 2 highways shall have edge lines painted as outlined in "Manual 23, PR5050, Traffic Line Painting".

Level 3 highways and any additional traffic lines will be painted as outlined in procedure in "Manual 23, PR5050, Traffic Line Painting".

RESOURCES

Equipment: 1 automatic paint truck
2 lead/ trail vehicles

Labour: 5 operators/painters

Materials: Totes of paint (yellow & white)
Glass beads

NORMAL PRACTICE

Activity is carried out by Provincial outfit or contracted out.

METHOD OF MEASUREMENT

Traffic line painting shall be recorded under “Activity 136, Traffic Line Painting” as line kilometers.

Line kilometers are defined as a single or double centre lines, edge lines or lane divider (skip) lines usually painted by an automated paint vehicle (i.e. A road with a centre line and two edge lines would have three (3) line kilometers per road kilometer.).

NORMAL OUTPUT

15-80 line kilometers per day

DEFINITION

Work under "Activity Type 164, Guide Post Maintenance", shall include straightening, resetting posts and replacing reflective delineators.

Work under "Activity Type 165, Guide Post Installation", shall include new installations or replacing missing, broken, excessively split or cracked guide posts.

PURPOSE

Guide posts are generally used for shoulder delineation. They can also be used to restrict access to and from provincial highways.

GENERAL

Guide posts that have excessively heaved, settled, or are excessively inclined, shall be reset to the proper horizontal and vertical alignment.

The Nova Scotia Standard Specifications, "Steel Guardrail Systems and Wooden Guide Posts" (Division 5, Section 6) provides specifications for the posts, rail and installation.

INSPECTION – Road Patrols

During routine inspections or as situations arise, the Supervisor shall identify and schedule repairs for any missing or severely damaged posts, as specified in the following "Conditions" section.

STANDARD

1. Guide Post Maintenance

   Guide posts requiring repair, including straightening, resetting and replacing reflective delineators, shall be repaired yearly before November 30th.

2. Guide Post Installation

Guide posts requiring replacement, including those that are missing, broken, excessively split or cracked, shall be replaced yearly before November 30th.

New installations of guide posts will be made at the discretion of the Supervisor in consultation with the Area Manager.

RESOURCES

Equipment: Drill or backhoe
Shovels

Labour: 1 operators
1-2 crew person(s)
Traffic control persons (as required)

Materials: Guideposts

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices.
- Excavate area for guidepost installation using applicable tool for the soil type.
- Install post ensuring it is plum and the correct length is exposed.
- Backfill and compact around post.
- Place subsequent posts at spacing recommended in Standard Specifications.
- Ensure the elevation and alignment of the posts is maintained.
- Install reflective delineators.

METHOD OF MEASUREMENT

"Activity 164, Guide Post Maintenance" - Each Post

"Activity 165, Guide Post Installation" - Each Post

NORMAL OUTPUT

Sandy/silty soil - 25

Rock - 2-5

DEFINITION

Work under “Activity Type 166, Guard Rail Maintenance”, shall include horizontal and vertical realignment of guard rail sections, including replacing reflective delineator.

Work under “Activity Type 167, Guard Rail Installation”, shall include new installations or replacing existing posts or blocks that are missing, broken, excessively split or cracked. Also includes replacing rails and channels that are severely dented, bent, flattened or twisted and repairing cables.

PURPOSE

A guard rail system is used to protect the motorist from a roadside hazard. Hazards can include bridge abutments or piers, light standards, embankments, etc.

GENERAL

To ensure the structural integrity of a guardrail system and safety to the travelling public: rails and channels that are severely damaged are to be replaced, cable guardrail shall be tensioned to specified range and guard rail posts that have excessively damaged or misaligned will be reset to the proper horizontal and vertical alignment.

The guard rail system is to be installed as per the “Nova Scotia Standard Specifications”, “Steel Guardrail Systems and Wooden Guide Posts” (Division 5, Section 6).

New installations will be made at the discretion of the Supervisor, in consultation with the Area Manager.

A guardrail system includes all rail elements, related hardware, reflectors, posts and blocks.

When a section of steel beam guard rail has been damaged by a motor vehicle accident, the Supervisor shall take immediate measures to prevent additional hazards to traffic until such time as permanent repairs can be made, cost may be recoverable.

INSPECTION – Road Patrols

During routine inspections or as situations arise, the Supervisor shall record deficiencies, post warning signs and schedule repairs as specified in the following "Standard" section.

The Supervisor shall provide the Area Manager with a prioritized list of road sections that exhibit the conditions as specified in the "Standard" section, subsection 2. This list shall be included in the "Annual Condition Defects Report".

STANDARD

1. Guard Rail Maintenance

   Guard rail posts that have excessively heaved, settled or are excessively inclined shall be reset to the proper horizontal and vertical alignment.

   Guard rail maintenance shall also include the replacement of reflective delineators on posts.

   All guard rail maintenance defects shall be repaired yearly before November 30th.

2. Guard Rail Installation

   Rails and channels that are severely damaged are to be replaced in accordance with the "Guard Rail Installation Response Time Table" below.

   Posts and blocks that severely damaged are to be replaced in accordance with the "Guard Rail Installation Response Time Table" below.

Guard Rail Installation Response Time Table

Guard Rail Maintenance and Installation	Level 1A	Level 1B & 2	Level 3 & 4
Repair or Replacement	21 Days	60 Days	120 Days

Areas where additional hazards have been identified, removal and replacement of guard rail sections over 50 m in length will be undertaken in consultation with the Area Manager.

If a hazard exists with the guard rail system, emergency safety precautions (barricades, signs, jersey barriers, drums, etc.) are to be taken immediately to safeguard the traveling public.

RESOURCES

Equipment: Post hole digger or backhoe
Drill (40 cm minimum length)
Shovels
Wrenches
Crow Bar

Labour: 1 operator if using backhoe
2-3 crew persons
Traffic control persons (as required)

Materials: Posts
Nuts and bolts
W beams and box beams
Cable
Zinc rich paint
Collapsible ends
Box beam posts
Cable barrier posts
Wire rope

NORMAL PRACTICE

- Complete hazard assessment.
- Set up temporary signing and traffic control devices (as required).

- Ensure the elevation and alignment of all guard rail is erected according to the Nova Scotia Standard Specifications, “Steel Guardrail Systems and Wooden Guide Posts” (Division 5, Section 6).

- Guardrail should be raised, when construction or maintenance activities alter the elevation of the roadway, to maintain the effective height above the road surface.

METHOD OF MEASUREMENT

Guard rail maintenance: Work shall be recorded under “Activity Type 166, Guard Rail Maintenance” as metres measured from centre bolt hole to centre bolt hole (3.81 metres).

Guard rail installation: Work shall be recorded under “Activity Type 167, Guard Rail Maintenance” as metres measured from centre bolt hole to centre bolt hole (3.81 metres).

Any work involving only posts shall be recorded as metres of the length of rail affected by the associated posts (i.e. Straightening or replacing one guard rail post may involve removing two lengths of guard rail and would be recorded as 2 x 3.81 m = 7.62 m).

NORMAL OUTPUT

Guardrail installation: 100-300 metres

Guardrail maintenance: 300-500 metres

DEFINITION

Snow and ice control includes plowing, anti-icing (direct liquid application (DLA)), salting, pre-wet salting, sanding, and ice blading of roads before, during and after winter weather events.

PURPOSE

The winter maintenance standards establish levels of service on provincial highways. The winter maintenance levels of service for snow and ice control are based on road classification and traffic volumes.

GENERAL

The Supervisor is responsible for ensuring that highways are maintained in accordance with these Winter Maintenance Standards.

The use of salt in environmentally sensitive areas will be monitored and alternatives to salt will be used where practical.

The use of brine as a DLA and/or to pre-wet salt reduces the amount of salt applied to the roads (thereby reducing the impact to the environment), shortens the amount of time required to clear the roads and improves public safety.

The Supervisor shall ensure an accurate inventory of salt is maintained. For stockpiles that have been cross sectioned, the conversion factor of 1405 kg/m^3 shall be used. The conversion factor shall be updated annually.

The Supervisor (or other authorized personnel) shall keep accurate and legible daily logs. The log shall consist of the following information:

- Temperature every hour
- Type and amount of precipitation every hour
- Dispatch, loading and end times for all vehicles
- Operators on duty
- Start and stop of storm event
- Type of activity being performed (plowing, salting, DLA, pre-wetting, sanding)
- Vehicle breakdowns or accidents
- Emergency calls to the dispatch

- Amount of material loaded (salt, brine and sand)
- Supervisor in charge

INSPECTIONS

1. Winter road patrols shall be carried out by designated personnel to monitor road and weather conditions as required. Inspection by road patrols shall cover all routinely observed road conditions, in addition to ensuring that winter levels of service are maintained.

2. The Supervisor is to follow the Department road reporting protocol regarding normal winter road condition reporting. The Supervisor (or other authorized personnel) shall update the Road Condition Reporting System (RCRS)/511 three times per day (6:00 am, 1:00 pm, 4:00 pm) during the winter season, and three times per day (8:00 am, 1:00 pm, 4:00 pm) during the shoulder seasons when weather requires. Any changes in severe weather or road conditions, which occur between specified reporting periods, should be updated immediately on the RCRS/511.

STANDARD

1. The following winter maintenance levels of service for snow and ice control are based on road classification and traffic volumes:

Levels of Service Table

LEVEL OF SERVICE	Level 1A	Level 1B	Level 2	Level 3	Level 4
Type of Roads	All 100 Series and selected high volume highways	Trunks and selected highways as per AADT limits	Routes and selected highways as per AADT Limits	All local roads	All gravel, double chip seal and sand seal roads
AADT Limits	Greater than 7,500	Between 7,500 – 4,000	Between 4,000 – 1,500	Less than 1,500	N/A

2. While this Maintenance Standard establishes levels of service, it is acknowledged that conditions may occur, which temporarily prevent achieving levels assigned. In

such cases, attempts shall be made to keep highways open by utilizing all available equipment.

3. During severe weather conditions, when it becomes evident to the Supervisor that available resources are not sufficient to maintain highways open and passable, the Supervisor shall immediately notify the Area Manager and the RCMP (or local Police force). The Area Manager will determine if the road shall be closed. The Supervisor is required to erect and maintain all road closures following the process outlined in Manual 23 PR5094 Emergency Highway Closing Mobilization.

4. Pre-treating with DLA may be carried out on various sections of paved roads as conditions warrant. Equipment can be deployed up to 16 hours prior to the start of the weather event (snowfall, frost/black ice). If the weather event is expected to start out with above freezing temperatures and rain, do not pre-treat as the chemical will be washed away. If the DLA pre-treatment is applied, an application of salt and/or pre-wet salt is not required at the beginning of the storm.

5. Pre-treating with pre-wet salt may be carried out on paved roads as conditions warrant. Equipment can be deployed up to 2 hours prior to the start of the weather event (snowfall, freezing rain, sleet). If the weather event is expected to start out with above freezing temperatures and rain, do not pre-treat as the salt will be washed away. If the pre-wet salt is applied, an application of salt is not required at the beginning of the storm.

6. From the time unfavourable road conditions occur and winter equipment is required for the safety of the public, it is essential that the response time is kept to a minimum.

7. The Supervisor shall deploy winter maintenance operations prior to the accumulations of the specified snow depth if the roads are hazardous, slippery, or ice or slush is developing.

Winter Levels of Service Description Table

CLASSIFICATION	DESCRIPTION	TIME LIMIT
Level 1A	Essentially bare pavement	Within 8 hours
Level 1B	Essentially bare pavement	Within 12 hours
Level 2	Centre line bare	Within 12 hours
Level 3	Centre line bare	Within 24 hours
Level 4	Snow packed	Within 24 hours

8. Levels of Service

8.1 Level 1A – Essentially Bare Pavement

The defined level of service for Level 1A is essentially bare pavement, and is the objective to be reached as soon as possible after the storm has ended or abated, normally within eight (8) hours. This level of service applies to 100 Series highways and other selected high volume highways with an average daily traffic volume greater than 7,500 vehicles per day. To achieve this level of service, the Supervisor shall remove snow and apply de-icer as described in these Maintenance Standards.

The use of de-icer is to be controlled, in terms of both quantity and frequency, to meet the specified level of service.

De-icers may be in the form of: 1) brine, or alternative, applied as a DLA; 2) as pre-wet salt, or 3) dry salt. DLA may be completed prior to the start of the storm. DLA may be used on road temperatures between 0°C and -7°C. Pre-wet salt may be used on road temperatures between 0°C and -10°C. Do not pre-wet if road temperature is below -10°C and falling. It is important to evaluate and monitor pavement temperatures, road and weather conditions and trends to ensure proper de-icing treatment and timing of treatment is made.

Sand shall not normally be applied on Level 1A highways. Sand shall only be applied to Level 1A highways during severe cold weather when extremely slippery conditions exist.

A summary of Level 1A service is shown in the “Levels of Service Table” above.

8.2 Level 1B – Essentially Bare Pavement

The defined level of service for Level 1B is essentially bare pavement, and is the objective to be reached, as soon as possible after the storm has ended or abated, normally within twelve (12) hours. This level of service applies to Trunk highways and other selected highways with an average daily traffic volume between 7,500 and 4,000 vehicles per day. To achieve this level of service, the Supervisor shall remove snow and apply de-icer as described in these Maintenance Standards.

The use of de-icer is to be controlled, in terms of both quantity and frequency, to meet the specified level of service.

De-icers may be in the form of: 1) brine, or alternative, applied as a DLA; 2) as pre-wet salt, or 3) dry salt. DLA may be completed prior to the start of the storm. DLA may be used on road temperatures between 0°C and -7°C. Pre-wet salt may be used on road temperatures between 0°C and -10°C. Do not pre-wet if road temperature is below -10°C and falling. It is important to evaluate and monitor pavement temperatures, road and weather conditions and trends to ensure proper de-icing treatment and timing of treatment is made.

Sand is to be applied to all roads or sections of a road designated as being in environmentally sensitive areas. The use of salt in environmentally sensitive areas will be monitored and alternatives to salt will be used where practical.

A summary of Level 1B service is shown in the “Levels of Service Summary Table” above.

8.3 Level 2 – Centre Line Bare

The defined level of service for Level 2 is a minimum centre line bare conditions, and is the objective to be reached as soon as possible after the storm has ended or abated, normally within twelve (12) hours and be maintained until conditions permit baring the pavement full width. This level of service applies to 200 and 300 series Routes and other selected highways with an average daily traffic volume between 4,000 and 1,500 vehicles per day. To achieve this level of service, the Supervisor shall remove snow and apply de-icer as described in these Maintenance Standards.

The use of de-icer is to be controlled, in terms of both quantity and frequency, to meet the specified level of service.

De-icers may be in the form of: 1) brine, or alternative, applied as a DLA; 2) as pre-wet salt, or 3) dry salt. DLA may be completed prior to the start of the storm. DLA may be used on road temperatures between 0°C and -7°C. Pre-wet salt may be used on road temperatures between 0°C and -10°C. Do not pre-wet if road temperature is below -10°C and falling. It is important to evaluate and monitor pavement temperatures, road and

weather conditions and trends to ensure proper de-icing treatment and timing of treatment is made.

Sand is to be applied to all roads or sections of a road designated as being in environmentally sensitive areas. The use of salt in environmentally sensitive areas will be monitored and alternatives to salt will be used where practical.

A summary of Level 2 service is shown in the "Levels of Service Summary Table".

8.4 Level 3 – Centre Line Bare

The defined level of service for Level 3 is a minimum centre line bare condition and is the objective to be reached as soon as possible after the storm has ended or abated, normally within twenty-four (24) hours, and be maintained until conditions permit baring the pavement full width. This level of service applies to all local paved roads with an average daily traffic volume of less than 1,500 vehicles per day. To achieve this level of service, the Supervisor shall remove snow and apply de-icer or sand as described in these Maintenance Standards.

The use of de-icer or sand is to be controlled, in terms of both quantity and frequency, to meet the specified level of service.

De-icers may be in the form of: 1) brine, or alternative, applied as a DLA; 2) as pre-wet salt, or 3) dry salt. DLA may be completed prior to the start of the storm. DLA may be used on road temperatures between 0°C and -7°C. Pre-wet salt may be used on road temperatures between 0°C and -10°C. Do not pre-wet if road temperature is below -10°C and falling. It is important to evaluate and monitor pavement temperatures, road and weather conditions and trends to ensure proper de-icing treatment and timing of treatment is made.

Sand is to be applied to all roads or sections of a road designated as being in environmentally sensitive areas. The use of salt in environmentally sensitive areas will be monitored and alternatives to salt will be used where practical.

The application of de-icer or sand will normally take place after a snowfall. The application of de-icer or sand may be applied at the beginning of a

storm to hills, turns, intersections or railway crossings or where geographical conditions require.

A summary of Level 3 service is shown in the "Levels of Service Summary Table".

Note: For purposes of pilot projects alternatives to above can be considered with prior approval of the Executive Director of Maintenance and Operations.

8.5 Level 4 – Snow Packed

This level of service requires that the road surface be maintained in a snow packed condition as soon as possible after the storm has ended or abated normally within twenty-four (24) hours. This level of service applies only to gravel roads, double chip seal roads and sand seal roads. To achieve this level of service the Supervisor shall remove snow and apply sand as described in these Maintenance Standards.

Gravel, double chip seal and sand seal roads shall only have sand or other approved abrasives applied. The use of salt or other de-icers is strictly prohibited.

The use of sand or other approved abrasives is to be limited, in terms of both quantity and frequency, and normally applied only to hills, turns, intersections, and railway crossings after a storm has ended. Level areas will not normally be sanded unless severe slippery conditions exist. Urban areas may require the full length of the road be sanded.

A snow packed surface is described as a smooth, hard, good driving surface with satisfactory friction with shoulders that are free of loose snow.

During warming trends, it may be more efficient and economical to bare the surface than to try to maintain a snow packed condition.

With the exception of double chip seal and/or sand seal roads, the Supervisor shall ice blade all snow packed surfaces that have washboarded, rutted, potholed, or which exhibit signs of developing slipperiness or where slipperiness has developed, especially due to rain or in rain conditions.

A summary of Level 4 service is shown in the "Levels of Service Summary Table".

Levels of Service Summary Table

LEVEL OF SERVICE	Level 1A	Level 1B	Level 2	Level 3	Level 4
Type of Road	All 100 Series and selected high volume highways	Trunks and selected highways as per AADT limits	Routes and selected highways as per AADT Limits	All local paved roads	All gravel, double chip seal and sand seal roads
AADT Limits	> 7,500	7,500 – 4,000	4,000 – 1,500	< 1,500	n/a
Primary Objective	Essentially bare pavement *****	Essentially bare pavement *****	Centre line bare	Centre line bare	Snow packed
Time to meet primary objective after the end of storm, not exceeding	8 hours	12 hours	12 hours	24 hours	24 hours
Direct Liquid Application (DLA) Application of DLA	up to 16 hours prior to start of storm	up to 16 hours prior to start of storm	up to 16 hours prior to start of storm	up to 16 hours prior to start of storm	n/a
Max. Application Rate	up to 120 l/lane km.	up to 120 l/lane km.	up to 120 l/lane km.	up to 120 l/lane km.	n/a
Pre-Wet Application of Pre-wet Salt	up to 2 hours prior to start of storm	up to 2 hours prior to start of storm	up to 2 hours prior to start of storm	up to 2 hours prior to start of storm	n/a
Max. Application Rate	up to 30%	up to 30%	up to 30%	up to 30%	n/a
Salting Application of salt	Beginning of storm (if no pre-treatment) and during, as required	Beginning of storm (if no pre-treatment) and during, as required	Beginning of storm (if no pre-treatment) and during, as required	Beginning of storm where required (if no pre-treatment), and after	n/a
Max. ** Application Rate (rate based on 2-lane road)	125 kg/CL km	125 kg/CL km	110 kg/CL km	85 kg/CL km	n/a
Plowing Begin plowing when snow accumulation	≤ 25 mm	≤ 25 mm	≤ 50 mm	During storm, as required	During storm, as required
Max allowable accumulation	≤ 75 mm	≤ 100 mm	≤ 150 mm	≤ 200 mm	≤ 200 mm
Sanding Application of sand	- Not normally sanded - Sand only during severe cold with slippery conditions	Beginning of storm for environmentally sensitive areas or during severe cold with slippery conditions	Beginning of storm for environmentally sensitive areas or during severe cold with slippery conditions	- Beginning of storm where required and after storm - for environmentally sensitive areas - slippery conditions when required	- After storm - For environmentally sensitive areas - Slippery conditions when required
suggested Application Rate (rate based on 2-lane road)	n/a	800 kg/CL km	800 kg/CL km	500 kg/CL km	500 kg/CL km

****** When pavement temperature drops below -10ºC the effectiveness of salt is decreased significantly. Time of day and temperature trends must be considered in salting decisions. With prior approval from the Area Manager, the Supervisor shall use sand or other approved abrasive materials to maintain an even surface free of loose snow with satisfactory friction. A roadway free of snow and ice is considered always to have satisfactory friction. A snow covered roadway has satisfactory friction if permitted vehicles can be driven on it with safety.*
*** Reduced application rates may be used. Reduced rates may be considered based on road temperature, trends, type of weather event, and time of year.*

RESOURCES

Equipment: Snow removal equipment

Labour: Operators
Dispatchers

Materials: Salt, sand, brine

NORMAL PRACTICE

- When conditions dictate, call out operators.
- Perform necessary activities to reach the specified levels of service

METHOD OF MEASUREMENT

"Activity 104, Plowing" – Kilometres

"Activity 105, Salting" – Tonnes

"Activity 106, Sanding" – Tonnes

"Activity 109, DLA" – Litres

NORMAL OUTPUT

N/A