

## Foreword

The Roads Department is constantly striving to increase the efficiency and effectiveness with which the management and maintenance of the road network are carried out. This is motivated by the recognition that the country's Public Highway Network of over 18,300 km constitutes one of the largest assets owned by the Government (estimated value in 2009 of 15 billion Pula), and that a less-than-optimal system for the management and maintenance of that asset, results in huge losses for the national economy. This occurs not only in the form of road deterioration and substantial reductions in road asset value but, even more so, in the form of increased vehicle operation costs which have to be borne by road users and which reduce the competitiveness of the country in an increasingly global economy.

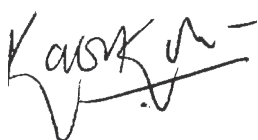
In exercising its vision "to have world class roads leading to prosperity", its mission "the Roads Department exists to enable provision of safe, reliable and cost effective road infrastructure in an environmentally sustainable manner" and its values "botho, transparency, accountability and integrity", the Roads Department has directed the development of a series of Design Manuals, Guidelines and Standards of which the **Botswana Roads Maintenance Manual (BRMM)** is one.

The purpose of the BRMM is to serve as a nationally recognised document, the application of which is deemed to serve as a standard reference and source of good practice for road management and maintenance by both public and private sector practitioners.

The major benefits to be gained in applying the BRMM are the harmonisation of professional practice and the ensuring of cost effective execution of maintenance operations to appropriate standards. This approach will contribute directly to the preservation of the substantial investments made in road provision and facilitate the attainment of appropriate levels of service on the road network and, ultimately, preservation of the substantial investments made in road provision.

The Manual, by its very nature, will require periodic updating to take account of the dynamic nature of developments in road technology. The Roads Department, therefore, would welcome comments and suggestions from any stakeholders as feedback on all aspects of the Manual during its implementation. All feedback will be carefully reviewed by professional experts with a view to amending future updates of the Manual.

Gaborone, May 2010



Mr. Kabo Phillip Kote  
Ag. DIRECTOR OF ROADS  
Roads Department  
Ministry of Transport and Communication

## Acknowledgements

This Manual is one of a series of technical manuals and guidelines produced under the Institutional Co-operation Agreement between the Roads Department and the Norwegian Public Roads Administration (NPRA). This Agreement fell under a NORAD Technical Assistance Programme to Roads Department that was co-funded by the Kingdom of Norway and the Government of the Republic of Botswana.

The Roads Department gratefully acknowledges the valuable contributions made by the Steering Committee that guided the project and reviewed the Manual as well as the Project Team that was responsible for writing the Manual.

### Steering Committee

---

#### Roads Department

E. Masimega (Chairman)	M. Kowa	J. Nwako
P.G. Alpajora	G.L. Letsatsi	M.P. Ramolefhe
M.S. Baele	K.M. Mmopa	O. Ramontsho
O.S. Dijokota	T. Moilwa	A. Saha
T. Giddie	B. Mokgethi	J. R. Sello
J. Kamona	B. Moetse	T. Sikalesele
B. Kemsley	P. Mungoo	D. Silanda
K.P. Kotokwe	A. Nkaro	

#### Gaborone City Council

K.C. Jain  
M. Katorah

#### Norwegian Public Roads Administration (NPRA)

J. Dahlen  
C. Overby

### Project Team

---

#### Gicon A/S, Norway (Lead Consultant)

O. Kr. Sylte (Gicon)

#### InfraAfrica (Pty) Ltd (Sub-Consultant)

M. I. Pinard (InfraAfrica)

#### Group Consult, Botswana (Regional Consultant)

M.E. Chiwanga  
D.K.H. Mungure  
H.G. Urrio

### Photographs

---

C. Overby, J. Dahlen (NPRA); H.G. Urrio (Group Consult); V. Arya, A. Kalasi, M. Sarma, M.S. Baele (Roads Department).

## Abbreviations

### A

AADT Annual Average Daily Traffic

### B

BRMS Botswana Road Management System

BRMM Botswana Road Maintenance Manual

BRDM Botswana Road Design Manual

BOBS Botswana Bureau of Standards

### C

cd Candela

### G

GCC General Conditions of Contract

### I

IRI International Roughness Index

### K

km Kilometre

KPI Key Performance Indicator

### L

lux SI unit of illuminance

### M

MSRBW Maintenance Standards for Road and Bridge Works

MSSRBW Maintenance Standard Specifications for Road and Bridge Works

MOPRBW Maintenance Operational Procedures for Road and Bridge Works

### N

NORAD Norwegian Agency for Development Cooperation

NPRA Norwegian Public Roads Administration

N/A Not Applicable

### O

OPRC Output and Performance Based Road Contract

## Maintenance Standards for Road and Bridge Works

### **P**

P	Pula, (currency of Botswana)
PIARC	Permanent International Association of Road Congresses
PHN	Public Highway Network

### **R**

RD	Roads Department
----	------------------

### **S**

SADC	Southern African Development Community
SAMI	Stress Absorbing Membrane Interlayer
SSRBW	Standard Specifications for Road and Bridge Works (Botswana)

### **T**

TRL	Transport Research Laboratory (UK)
TL	Threshold Level

### **V**

vpd	vehicles per day
-----	------------------

## TABLE OF CONTENTS

Foreword .....	i
Acknowledgements .....	ii
Abbreviations .....	iii
<b>1. Introduction .....</b>	<b>1</b>
1.1 The Road Network .....	1
1.2 The Road Asset .....	1
1.3 Importance of Maintenance .....	1
1.4 Need for a Road Maintenance Manual .....	1
<b>2. The Road Maintenance Manual .....</b>	<b>2</b>
2.1 Purpose .....	2
2.2 Structure and Contents of Manual .....	2
2.3 Development of the Manual .....	3
2.4 Benefits of Using the Manual .....	3
2.5 Service Levels for the BRMM .....	3
2.6 Updating of the Manual .....	3
2.7 Sources of Information .....	3
<b>3 Introduction To Part B - Maintenance Standards .....</b>	<b>4</b>
3.1 Introduction .....	4
3.2 Objectives .....	4
3.3 Users of the Manual .....	4
3.4 Coding .....	5
<b>4 Maintenance Performance Standards .....</b>	<b>6</b>
<b>8100 Road Reserve .....</b>	<b>6</b>
8101 Scope .....	6
<b>8110 Vegetation Control .....</b>	<b>8</b>
8111 Grass Cutting .....	9
8112 Creeper Grass Removal .....	10
8113 Bush Clearing .....	11
8114 Trees Trimming .....	12
8115 Trees Removal .....	13
8116 Morama Tuber Removal .....	14
8117 De-stumping .....	15
<b>8120 Animals Control .....</b>	<b>16</b>
8121 Fence Repair .....	17
8122 Gate Repair .....	18
8123 Cattle Grid Repair .....	19

## Maintenance Standards for Road and Bridge Works

8124	Keeping Animals off Road Reserve .....	20
8125	Moles Control.....	21
<b>8130</b>	<b>Rest Area Maintenance.....</b>	<b>22</b>
8131	Rest Area Cleaning .....	23
8132	Rest Area Facilities Repair .....	24
8133	Rest Area Reshaping .....	25
8134	Rest Area Regravelling.....	26
8135	Rest Area Resealing.....	27
8136	Rest Area Fogspray.....	28
8137	Rest Area Bituminous Overlay.....	29
<b>8140</b>	<b>Litter Control and Obstacles Removal.....</b>	<b>30</b>
8141	Litter Collection and Removal.....	31
8142	Obstacles Collection and Removal .....	32
8143	Dead Animals Removal.....	33
8144	Abandoned Vehicles and Scrap Removal .....	34
8145	Anthills Removal .....	35
8146	Illegal Signs and Other Encroachments Removal.....	36
<b>8150</b>	<b>Slopes Maintenance.....</b>	<b>37</b>
8151	Slope Erosion Prevention.....	38
8152	Slope Erosion Repair.....	39
<b>8160</b>	<b>Landscaped Areas Maintenance.....</b>	<b>40</b>
8161	Trees, Grass and Flowers Planting.....	41
8162	Trees, Grass and Flowers Watering .....	42
8163	Trees, Grass and Flowers Cutting and Trimming .....	43
8164	Special Features Maintenance .....	44
8165	Landscaped Areas Cleaning.....	45
<b>8200</b>	<b>Paved Roadway .....</b>	<b>46</b>
8201	Scope.....	46
<b>8210</b>	<b>Bituminous Paved Roadway Routine Maintenance .....</b>	<b>48</b>
8211	Paved Roadway Cleaning .....	49
8212	Rutting and Depressions Repair.....	50
8213	Pothole Patching, Edge Damage and Surface Failure Repair .....	52
8214	Unpaved Shoulder Maintenance .....	54
8215	Crack Sealing .....	56
8216	Bleeding Repair .....	57
8217	Salt Blisters Repair .....	58

## Maintenance Standards for Road and Bridge Works

<b>8220</b>	<b>Bituminous Paved Roadway Periodic Maintenance.....</b>	<b>59</b>
8221	Fogspray .....	60
8222	Resealing.....	61
8223	Bituminous Overlay .....	62
8224	Unpaved Shoulder Regravelling and Edge Drop Repair .....	63
8225	Unpaved Shoulder Reshaping .....	64
<b>8230</b>	<b>Concrete Paved Roadway Maintenance .....</b>	<b>65</b>
8231	Concrete Roadway Cleaning .....	66
8232	Concrete Roadway Crack Sealing .....	67
8233	Concrete Roadway Spalling Repair .....	68
8234	Concrete Roadway Pothole Repair.....	69
8235	Concrete Roadway Joint Stepping Repair .....	70
8236	Concrete Roadway Slab Repair.....	71
<b>8240</b>	<b>Block Paved Roadway Maintenance.....</b>	<b>72</b>
8241	Block Paved Roadway Cleaning .....	73
8242	Block Paved Roadway Deformation Repair.....	74
8243	Paving Blocks Replacement.....	75
8244	Block Paved Roadway Grass Removal.....	76
<b>8250</b>	<b>Paved Footpath and Cycle Path Maintenance .....</b>	<b>77</b>
8251	Paved Footpath and Cycle Path Cleaning.....	78
8252	Paved Footpath and Cycle Path General Surface Repair .....	79
<b>8300</b>	<b>Unpaved Roadway .....</b>	<b>80</b>
8301	Scope.....	80
<b>8310</b>	<b>Unpaved Roadway Routine Maintenance.....</b>	<b>81</b>
8311	Dragging .....	82
8312	Maintenance of Sand Cushioning Layer .....	83
8313	Dry Grading .....	84
8314	Unpaved Roadway Pothole Patching.....	85
8315	Unpaved Roadway Erosion Runnels Repair .....	86
8316	Dust Prevention.....	87
<b>8320</b>	<b>Unpaved Roadway Periodic Maintenance .....</b>	<b>88</b>
8321	Wet Grading.....	89
8322	Reshaping.....	90
8323	Regravelling.....	91
8324	Sand Cushioning.....	92
<b>8330</b>	<b>Unpaved Footpath and Cycle Path Maintenance .....</b>	<b>93</b>
8331	Unpaved Footpath and Cycle Path Cleaning.....	94
8332	Unpaved Footpath and Cycle Path General Surface Repair .....	95

## Maintenance Standards for Road and Bridge Works

<b>8400</b>	<b>Drainage Facilities .....</b>	<b>96</b>
8401	Scope.....	96
<b>8410</b>	<b>Culvert Maintenance .....</b>	<b>98</b>
8411	Culvert Cleaning .....	99
8412	Culvert Headwall, Wing Wall and Marker Post Repainting .....	101
8413	Culvert Headwall, Wing Wall, Inlet and Outlet Structures Repair.....	102
8414	Culvert Repair.....	103
8415	Culvert Marker Post Reinstatement/Replacement .....	104
8416	Culvert Marker Post Reflector Replacement .....	105
<b>8420</b>	<b>Drain Maintenance .....</b>	<b>106</b>
8421	Drain Clearing, Cleaning and Desilting .....	107
8422	Unlined Drain Erosion Repair .....	109
8423	Unlined Drain Reshaping.....	110
8424	Drain Lining Repair.....	111
8425	Concrete Lining Joints Repair .....	112
8426	Concrete Lining Weep Holes Cleaning.....	113
8427	Drain Cover Repair/Replacement .....	114
<b>8430</b>	<b>Catchpit, Manhole and Drainage Pipe Maintenance .....</b>	<b>115</b>
8431	Catchpit, Manhole and Drainage Pipe Cleaning and Clearing.....	116
8432	Manhole/Catchpit Cover Replacement .....	117
8433	Drainage Pipe Relaying/Replacement .....	118
8434	Catchpit/Manhole Repair.....	119
8435	Drainage Pipe Repair .....	120
<b>8440</b>	<b>Erosion Protection Works Maintenance .....</b>	<b>121</b>
8441	Stone Pitching Repair.....	122
8442	Concrete Erosion Protection Works Repair.....	123
8443	Gabion Repair .....	124
8444	Scour Check and Chute Repair .....	125
8445	Berm Maintenance.....	126
<b>8500</b>	<b>Bridges.....</b>	<b>127</b>
8501	Scope.....	127
<b>8510</b>	<b>Bridge Routine Maintenance .....</b>	<b>128</b>
8511	Bridge Deck Cleaning.....	129
8512	Bridge Joints, Scupper Drains and Weep Holes Cleaning .....	130
8513	Bridge Bearings Cleaning .....	131
8514	Bridge Erosion Repair.....	132
8515	Bridge Concrete Repair.....	133
8516	Bridge Wearing Surface Maintenance.....	134



## Maintenance Standards for Road and Bridge Works

8517	Bridge Rail, Safety Barrier and Parapet Maintenance and Minor Repairs.....	135
8518	Bridge Steel Component Repair.....	136
<b>8520</b>	<b>Bridge Periodic Maintenance.....</b>	<b>137</b>
8521	Bridge Bearing Realignment and Replacement.....	138
8522	Bridge Rust Removal and Repainting.....	139
8523	Bridge Steel Components Replacement.....	140
8524	Bridge Inspection.....	141
<b>8530</b>	<b>Waterway Maintenance and Repair.....</b>	<b>142</b>
8531	Waterway Debris and Obstacles Removal.....	143
8532	Waterway Erosion Repair.....	144
8533	Waterway Desilting.....	145
<b>8600</b>	<b>Misellaneous Structures.....</b>	<b>146</b>
8601	Scope.....	146
<b>8610</b>	<b>Drift, Causeway and Ferry Landing Maintenance.....</b>	<b>147</b>
8611	Drift, Causeway and Ferry Landing Structure Damage Repair.....	148
8612	Waterway Cleaning and Clearing.....	149
8613	Unlined Drift Reshaping.....	150
8614	Marker/Guide Post Reinstatement/Replacement.....	151
8615	Marker/Guide Post Repainting.....	152
8616	Marker/Guide Post Reflector Replacement.....	153
8617	Grouted Stone Pitching Repair.....	154
<b>8620</b>	<b>Retaining Wall Maintenance.....</b>	<b>155</b>
8621	Retaining Wall Minor Repairs.....	156
8622	Retaining Wall Weep Holes Cleaning.....	157
8623	Retaining Wall Vegetation Clearing.....	158
<b>8630</b>	<b>Railway Crossing Maintenance.....</b>	<b>159</b>
8631	Railway Crossing General Repair.....	160
<b>8640</b>	<b>Veterinary Dip Maintenance.....</b>	<b>161</b>
8641	Veterinary Dip General Repair.....	162
<b>8650</b>	<b>Subway Maintenance.....</b>	<b>163</b>
8651	Subway General Repair.....	164
<b>8660</b>	<b>Weighbridge Area Maintenance.....</b>	<b>165</b>
8661	Weighbridge Area General Repair.....	166
<b>8700</b>	<b>Road Furniture, Sign and Traffic Markings.....</b>	<b>167</b>
8701	Scope.....	167

## Maintenance Standards for Road and Bridge Works

<b>8710</b>	<b>Road Furniture Maintenance .....</b>	<b>168</b>
8711	Guardrail Maintenance .....	169
8712	Kerbstone Maintenance .....	170
8713	Kerb Maintenance .....	171
8714	Distance Marker Maintenance .....	172
8715	Pedestrian Railing Maintenance.....	173
8716	Street Lighting Maintenance.....	174
8717	Traffic Signalling Devices Maintenance.....	175
<b>8720</b>	<b>Road Signs Maintenance .....</b>	<b>177</b>
8721	Road Sign Cleaning.....	178
8722	Road Sign Repainting.....	179
8723	Road Sign Repairs .....	181
8724	Road Sign Replacement .....	182
<b>8730</b>	<b>Road Marking Maintenance .....</b>	<b>183</b>
8731	Road Marking Repainting.....	184
8732	Reflective Stud Maintenance.....	185
<b>8740</b>	<b>Rumble Strips and Speed Hump Maintenance.....</b>	<b>186</b>
8741	Rumble Strips Maintenance.....	187
8742	Speed Hump Maintenance .....	188
<b>8800</b>	<b>Emergencies .....</b>	<b>189</b>
8801	Scope.....	189
<b>8810</b>	<b>Flooding and Washout Repair.....</b>	<b>193</b>
8811	Traffic Control, Safety Measures and Notification.....	194
8812	Construction of Diversions.....	195
8813	Excavation and Removal of Unsuitable Material.....	196
8814	Reinstatement of Roadway Structure .....	197
<b>8820</b>	<b>Land Slide Removal .....</b>	<b>198</b>
8821	Traffic Control, Safety Measures and Notification.....	199
8822	Construction of Diversions .....	200
8823	Excavation and Removal of Material from Roadway.....	201
8824	Reinstatement of Roadway Structure .....	202
<b>8830</b>	<b>Major Obstacles Removal.....</b>	<b>203</b>
8831	Traffic Control, Safety Measures and Notification.....	204
8832	Construction of Diversions.....	205
8833	Removal of Major Obstacle .....	206
8834	Repair Damage to Pavement.....	207

## Maintenance Standards for Road and Bridge Works

<b>8840</b>	<b>Damaged/Washed Out Culvert Replacement.....</b>	<b>208</b>
8841	Traffic Control, Safety Measures and Notification.....	209
8842	Construction of Diversions .....	210
8843	Removal of Existing Culvert.....	211
8844	Repair and Replacement of Culvert.....	212
8845	Excavation and Backfilling.....	213
8846	Reinstatement of Pavement and Embankments .....	214
<b>8850</b>	<b>Damaged/Washed Out Miscellaneous Structures Replacement.....</b>	<b>215</b>
8851	Traffic Control, Safety Measures and Notification.....	216
8852	Construction of Diversions.....	217
8853	Removal of Existing Structure.....	218
8854	Repair and Replacement of Structure .....	219
8855	Excavation and Backfilling.....	220
8856	Reinstatement of Pavement and Embankments .....	221
<b>8860</b>	<b>Repair to Damaged Utilities Within the Road Reserve .....</b>	<b>222</b>
8861	Traffic Control, Safety Measures and Notification.....	223
8862	Construction of Diversions.....	224
8863	Repair of Damaged Utilities Within the Road Reserve .....	225
8864	Reinstatement of Roadway Structure .....	226
<b>8900</b>	<b>Miscellaneous Features .....</b>	<b>227</b>
8901	Scope.....	227
<b>8910</b>	<b>Traffic Control and Safety Measures.....</b>	<b>227</b>
8911	Placement of Warning Signs Only .....	227
8912	Lane Closure .....	227
8913	Barricading Work Area .....	227
8914	Diversions.....	227
<b>8920</b>	<b>Procurement of Materials for Maintenance Works.....</b>	<b>227</b>
8921	Determining Materials Required.....	227
8922	Identifying Sources of Material.....	227
8923	Procurement of Materials .....	227
8924	Storage of Materials.....	227
8925	Transportation of Materials to Site.....	227
<b>8930</b>	<b>Process and Quality Control Testing.....</b>	<b>227</b>
8931	Process Control Testing.....	227
8932	Quality Control Testing .....	227

## Maintenance Standards for Road and Bridge Works

<b>8940</b>	<b>Sourcing and Extraction of Borrow Materials .....</b>	<b>227</b>
8941	Investigation of Potential Borrow Area / Quarry .....	227
8942	Selection of the Most Suitable Borrow Area / Quarry .....	227
8943	Opening of Borrow Pit / Quarry and Extraction of Materials .....	227
8944	Loading and Hauling Borrow Materials .....	227
8945	Rehabilitation and Closure of Borrow Area / Quarry .....	227
<b>8950</b>	<b>Tools and Equipment .....</b>	<b>227</b>
8951	Safety and Health Tools .....	227
8952	Monitoring and Supervision Tools and Equipment .....	227
8953	Working Tools and Equipment.....	227
8954	Usage and Maintenance of Hand Tools .....	227
8955	Usage of Equipment and Vehicles .....	227
8956	Maintenance of Equipment and Vehicles .....	228
<b>8960</b>	<b>Labour.....</b>	<b>228</b>
8961	Recruitment of Labour.....	228
8962	Conditions of Work.....	228
8963	Safety and Health of Personnel .....	228
8964	Payment of Wages.....	228
<b>8970</b>	<b>Reporting Forms .....</b>	<b>228</b>
8971	Resource Requirements and Cost Estimates for Maintenance Works .....	228
8972	Work Report and Resources Utilization .....	228
<b>8990</b>	<b>Other Miscellaneous Features .....</b>	<b>228</b>

## ANNEXES

<b>Annex A</b>	- References.....	229
<b>Annex B</b>	- Glossary of Terms.....	230
<b>Annex C</b>	- List of Maintenance Features, Interventions and Activities .....	241

## 1. INTRODUCTION

### 1.1 The Road Network

1.1.1 Botswana has developed a modern, functionally classified, Public Highway Network (PHN) of approximately 18,300 km (2009) of Primary, Secondary, Tertiary and Access roads. Responsibility for the management of the PHN is shared between Central Government, administered by Roads Department, and Local Government, administered by the City Council and a number of Town and District Councils. In addition to the PHN, there are over 3000 km of primary and secondary roads and streets in urban areas (city, towns and villages) which are the responsibility of the City, Town or District Councils. There are also some 15,000 km of access tracks, quasi-private roads, minor tracks, etc. Thus, the total length of the road network in Botswana is approximately 36,500 km (2010).

### 1.2 The Road Asset

1.2.1 Currently, the road network represents one of the country's largest public sector assets with replacement costs of the main (primary and secondary) roads alone amounting to more than P15 billion (2009). This astronomical investment in the road network reflects its multi-purpose role in the national economy involving social, business and commercial travel as well as freight and private transport, all of which use the same network. This network provides the dominant mode of freight and passenger transport and carries approximately 90 % of the total volume of passengers transported.

### 1.3 Importance of Maintenance

1.3.1 With the backbone of the national road network in place, development expenditure in relation to recurrent expenditure has begun to taper off. Thus, in order to preserve the huge investments that have been made in the provision of road infrastructure, maintenance funding will continue to rise and to eventually exceed development expenditure (ref. Figure 1.1). This will require that emphasis is placed on carrying out road maintenance in a pro active and efficient manner. Moreover, it will also require that cognizance be taken of international developments and trends in road maintenance in which the private sector is playing an increasingly significant role.

### 1.4 Need for a Maintenance Manual

1.4.1 The need for a comprehensive Road Maintenance Manual to assist roads agencies in maintaining the road network in an efficient manner has long been recognized as being of critical importance to all stakeholders in both the public sector (Roads Department and other roads agencies) and the private sector (consultants, contractors, materials suppliers, etc.). To this end, the Ministry of Transport and Communication, with the support of the Norwegian Public Roads Administration (NPRA) has embarked on the development of such a Manual and has engaged consultants to undertake this task under the direction of a Steering Committee from Roads Department.

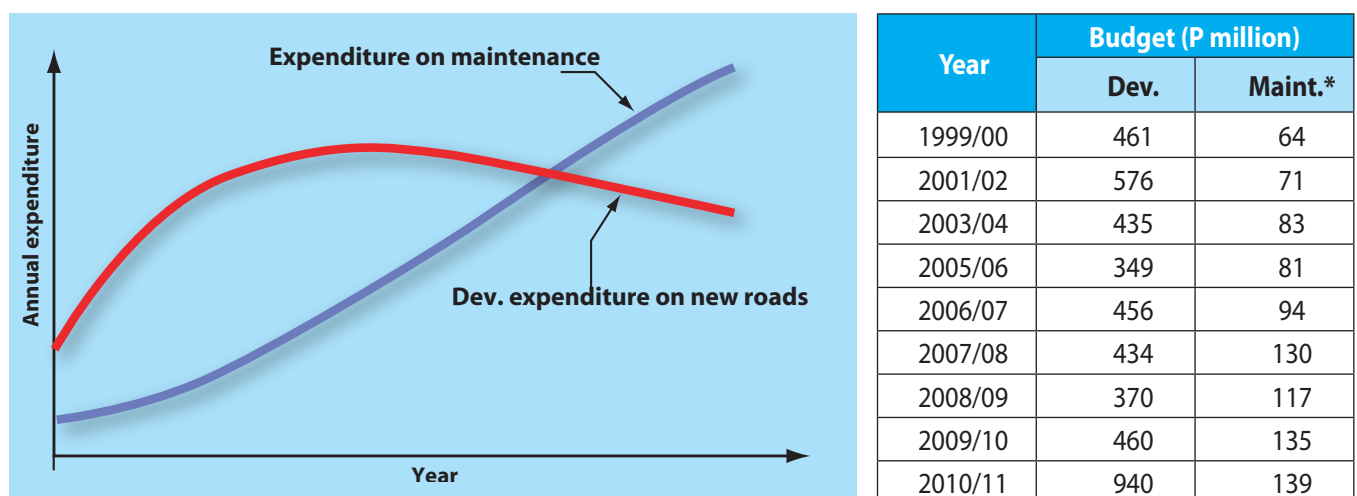


Figure 1.1 – General trend in expenditure on roads

\* Money given from vote no 00811 Roads.

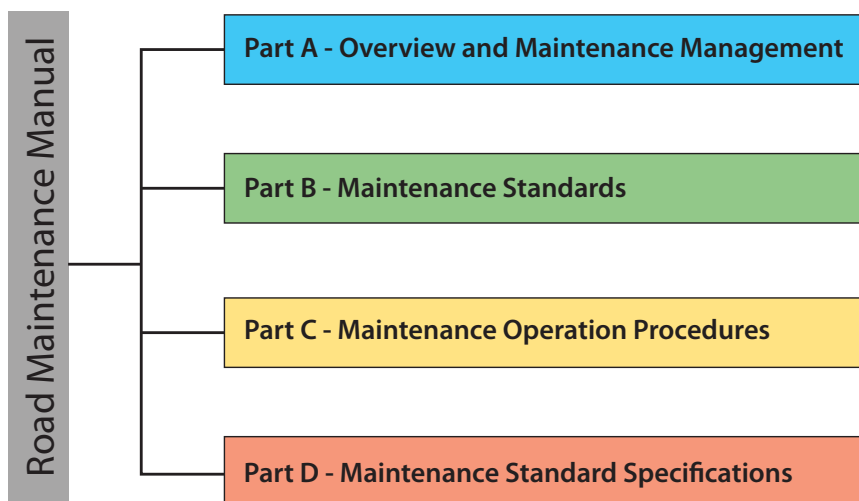
## 2. THE ROAD MAINTENANCE MANUAL

### 2.1 Purpose

2.1.1 The main purpose of the Botswana Road Maintenance Manual (BRMM) is to serve as a nationally recognized document, the application of which is deemed to serve as a standard reference and ready source of good practice for road maintenance management and operations. In so doing, the objective is *to improve the efficiency and effectiveness of road maintenance in Botswana*. In this regard, the Manual provides guidance to a spectrum of stakeholders on maintenance standards, specifications and operational procedures for maintenance works on both paved and unpaved roads. The Manual is based on maintenance activities relevant to the Botswana environment and is tailored for execution of maintenance works by either in-house units, by contracts based on unit rates or by Output and Performance-Based Road Contracts (OPRC).

### 2.2 Structure and Contents of Manual

2.2.1 The Manual is divided into four separate parts as follows:



**Figure 2.1** – Components of the Road Maintenance Manual

2.2.2 The contents of the Manual are as follows:

#### **Part A – Overview and Maintenance Management**

**Section A:** Provides a general introduction to the Manual including its purpose and scope, approach to its development and means of updating.

**Section B:** Presents an introduction to maintenance management in Botswana and summarizes the general policies and objectives of the Roads Department that seek to optimize the overall performance of the road network over time. Also reviews the planning, programming, preparation and operations functions carried out by the department.

**Part B – Maintenance Standards:** Provides service quality standards defined through threshold levels and response times in relation to road function and traffic levels for a complete set of maintenance activities.

**Part C – Maintenance Operational Procedures:** Provides a description of the operational procedures for a complete set of maintenance activities applicable to both labour and equipment based methods. For each method, a description is provided for the required resources, work procedure and average production.

**Part D – Maintenance Standard Specifications:** Contains details of the standard specifications related to a wide range of both routine and periodic maintenance activities on both paved and unpaved roads as well as bridges and drainage structures.

Parts B, C and D collectively provide a complete, inter-related set of maintenance standards, operational procedures and maintenance specifications for an extensive range of maintenance features and related interventions and activities as listed in Annex C.

### 2.3 Development of the Manual

2.3.1 The means of achieving the purpose of the Manual hinges critically on its adoption by stakeholders in practice. To this end, the Manual has been developed with a high level of participation by local practitioners, led by a Steering Committee at Roads Department. As a result, it has been possible to incorporate a significant amount of local, practical knowledge in the document based on local best practice.

### 2.4 Benefits of Using the Manual

2.4.1 The major benefits to be gained in applying the Manual are harmonization of professional practice and execution of maintenance activities in a holistic manner. This will ensure uniform execution of the various maintenance activities and facilitate the attainment of appropriate levels of service and cost-effective preservation of Botswana's road asset.

2.4.2 The Manual will be of interest to a range of stakeholders at roads authorities as well as in the private sector including the following:

- Top level management of roads authorities.
- Regional maintenance engineers.
- Road maintenance supervisors & technicians.
- Road maintenance consultants.
- Road maintenance contractors.
- Training institutions.
- Community leaders.
- Road users.

### 2.5 Service Levels for the BRMM

2.5.1 Three *Service Levels* are adopted in the Manual for both paved and unpaved roads. These Service Levels are used to define a measure of the extent of *Deficiencies* and *Defects* the Road Authority is willing to tolerate over a specified time span on individual roads, depending on traffic levels and road function. The three Service Levels are as follows:

- **Level A:** All strategic/reference routes A1, A2 and A3 and any other road with AADT  $\geq$  1000 vpd.
- **Level B:**  $500 < \text{AADT} < 1000$  vpd.
- **Level C:**  $\text{AADT} \leq 500$  vpd.

### 2.6 Updating of the Manual

2.6.1 There are continuing developments in maintenance management and practice as a result of which it will be necessary to update the Manual periodically to reflect current best practices. The format of the *Manual* enables its expansion, refinement and updating over time on the basis of experience.

2.6.2 The intention is to issue amendments periodically which replace or amplify particular aspects of the manual. Either full sections or particular figures, tables or appendices may be replaced. When this is done, details of the change should be recorded in the Amendment Sheet at the front of the document as more information becomes available from the development of new technologies and practices.

### 2.7 Sources of Information

2.7.1 In addition to the references cited at the end of each part of the manual, a bibliography has also been compiled for those readers who wish to obtain additional information on any of the topics dealt with in the manual.

### 3 INTRODUCTION TO PART B: MAINTENANCE STANDARDS

#### 3.1 Introduction

- 3.1.1 Road conditions can be expressed through indicators for service quality levels. These indicators, such as rutting, corrugations, cracking, conditions of road signs and road furniture etc. are then used to define the desired performance of the responsible road agency, whether a contractor or a public road authority.
- 3.1.2 The maintenance performance standards that are defined for each maintenance activity under paragraph 4 below are required to define the above mentioned service quality levels. The maintenance performance standards have been developed to ensure that the physical conditions of the road network are adequate for the road users.
- 3.1.3 The maintenance performance standards have been structured to fit the specific nature of an OPRC, which differs substantially from traditional contracts for civil works. In an OPRC most of the payment to a contractor would not be based on measured quantities and unit prices for works inputs, but on compliance with the predetermined service quality levels of the roads.

#### 3.2 Objectives

- 3.2.1 The objectives of the Maintenance Standards for Road and Bridge Works (MSRBW) are:
- Ensuring uniformity and consistency of the maintenance service levels provided across Botswana.
  - Providing the basic service quality standards and performance criteria for Output and Performance Based Road Contracts (OPRC).
- 3.2.2 The MSRBW are included as Part B in the Botswana Road Maintenance Manual (BRMM). The BRMM further consists of:
- Part A – Overview and Maintenance Management.
  - Part C – Maintenance Operational Procedures for Road and Bridge Works.
  - Part D – Maintenance Standard Specifications for Road and Bridge Works.
- 3.2.3 Users should note that the MSRBW, by themselves, do not provide a complete record of all processes and procedures related to the delivery of maintenance activities. They should be read in conjunction with the Standard Specifications for Road and Bridge Works (Botswana), issued by the Director of Roads, and in the following referred to as SSRBW. Similar to relevant Botswana Bureau of Standards and in the following referred to as BOBS. The most relevant Definitions and Terms are included in Part D – Chapter 4 under clause 8020 General Requirements and Provisions. The term “Engineer”, which is used throughout the BRMM, shall mean the person appointed by the Employer to act as Engineer or his duly authorized representatives or assignees

#### 3.3 Users of the Manual

- 3.3.1 Users of the Manual are expected to come both from the public and the private sector. Road agencies or other relevant authorities are foreseen to actively use it as a reference document in order to ensure adequate road service levels for different types of road and to harmonise professional practise throughout the country. Road agencies or other relevant authorities are also expected to use the Manual as essential parts of contract documents when tendering for maintenance contracts.
- 3.3.2 For the private road contractors, the Manual offers a comprehensive description of maintenance procedures and standards. And it offers an opportunity for private contractors to participate in road management on a wider basis. The Manual facilitates use of OPRC, which may significantly expand the role of the private sector in road management, from execution of individual works contracts to the conservation of road assets over a longer period of time.



### 3.4 Coding

3.4.1 The coding (i.e. numbering of activities) used in the MSRBW is based on a three tier system. A FEATURE embraces all the INTERVENTIONS which include all the Activities that fall under it. The same coding is used also for Part D – Maintenance Standard Specifications for Road and Bridge Works (MSSRBW). For example FEATURE 8100 ROAD RESERVE MAINTENANCE, embraces the following INTERVENTIONS:

- 8110 Vegetation Control
- 8120 Animals Control
- 8130 Rest Area Maintenance
- 8140 Litter Control and Obstacles Removal
- 8150 Slopes Maintenance
- 8160 Landscaped Areas Maintenance.

and INTERVENTION 8110 Vegetation Control embraces the following Activities:

- 8111 Grass Cutting
- 8112 Creeper Grass Removal
- 8113 Bush Clearing
- 8114 Trees Trimming
- 8115 Trees Removal
- 8116 Morama Tuber Removal
- 8117 De-stumping
- 8119 Other Vegetation Control

3.4.2 Under each FEATURE the numbers “90” and “9” have been reserved for Interventions and Activities respectively that have currently not been identified. For example under FEATURE EMERGENCIES the Intervention 8890 is reserved for Other Emergencies and Activity 8819 under Intervention 8810 Washout Repair is reserved for Other Washout Repair Works. These Interventions and Activities have not been included in the main text of this document..

3.4.3 Each Activity has a standard format. For example Activity 8111 Grass Cutting includes:

- Defects, Main Causes, Effects
- Purpose and Description
- Service Quality Standard; and
- Threshold Level - Response Time

3.4.4 In the Defect/Threshold Level – Response Time tables the letters (d), and (w) have been used to denote day(s), and week(s) respectively.

### 4 MAINTENANCE PERFORMANCE STANDARDS

#### 8100 ROAD RESERVE

##### 8101 Scope

Feature 8100 Road Reserve covers interventions in the entire road reserve, including vegetation control, control of straying animals, maintenance of rest areas, including bus stops and lay-byes, litter control and obstacles removal, maintenance of slopes and maintenance of landscaped areas.

The feature "Road Reserve" shall be defined as per the Botswana Road Design Manual (BRDM) and the Standard Specifications for Road and Bridge Works (SSRBW).

The feature 8100 Road Reserve covers the following interventions and activities:

##### 8110 Vegetation Control

- 8111 Grass Cutting
- 8112 Creeper Grass Removal
- 8113 Bush Clearing
- 8114 Trees Trimming
- 8115 Trees Removal
- 8116 Morama Tuber Removal
- 8117 De-stumping
- 8119 Other Vegetation Control

##### 8120 Animals Control

- 8121 Fence Repair
- 8122 Gate Repair
- 8123 Cattle Grid Repair
- 8124 Keeping Animals off Road Reserve
- 8125 Moles Control
- 8129 Other Animals Control

##### 8130 Rest Area Maintenance

- 8131 Rest Area Cleaning
- 8132 Rest Area Facilities Repair
- 8133 Rest Area Reshaping
- 8134 Rest Area Regravelling
- 8135 Rest Area Resealing
- 8136 Rest Area Fogspray
- 8137 Rest Area Bituminous Overlay
- 8139 Other Rest Area Maintenance

### **8140 Litter Control and Obstacles Removal**

- 8141 Litter Collection and Removal
- 8142 Obstacles Collection and Removal
- 8143 Dead Animals Removal
- 8144 Abandoned Vehicles and Scrap Removal
- 8145 Anthills Removal
- 8146 Illegal Signs and Other Encroachments Removal
- 8149 Other Litter Control and Obstacles Removal

### **8150 Slopes Maintenance**

- 8151 Slope Erosion Prevention
- 8152 Slope Erosion Repair
- 8159 Other Slopes Maintenance

### **8160 Landscaped Areas Maintenance**

- 8161 Trees, Grass and Flowers Planting
- 8162 Trees, Grass and Flowers Watering
- 8163 Trees, Grass and Flowers Cutting and Trimming
- 8164 Special Features Maintenance
- 8165 Landscaped Areas Cleaning
- 8169 Other Landscaped Areas Maintenance

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE: 8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE: 8110

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8111 Grass Cutting</li> <li>8112 Creeper Grass Removal</li> <li>8113 Bush Clearing</li> <li>8114 Trees Trimming</li> <li>8115 Trees Removal</li> <li>8116 Morama Tuber Removal</li> <li>8117 De-stumping</li> <li>8119 Other Vegetation Control</li> </ul> <p>Activity 8119 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8111 to 8119.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8110 shall be as shown in the table below.</p>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
Grass height not to exceed H = 500 mm in Road Reserve	2 w	Grass height not to exceed H = 600 mm in Road Reserve	3 w	Grass height not to exceed H = 700 mm in Road Reserve	4 w
Not more than 5 bushes per 100 m road, or any single bush higher than 500 mm	2 w	Not more than 10 bushes per 100 m road, or any single bush higher than 750 mm	3 w	Not more than 20 bushes per 100 m road, or any single bush higher than 1000 mm	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8110
<b>Activity</b>	Grass Cutting	Code :	8111

### Defects, Main Causes and Effects

**Defects:** Too high or unwanted vegetation on roadside areas and on roadway.

**Main Causes:** Grass, shrubs and weeds have been allowed to grow unattended.

**Effects:**

- Surface water can pond at the edge of the carriageway and weaken the pavement structure.
- Silt accumulates at the edge of the carriageway.
- Visibility for road users is reduced with increased risk of accidents with persons and/or animals and vehicles.
- Vegetation can block the drainage system.
- Increased fire hazard in the dry season.
- Attracts domestic animals onto the road reserve.

### Purpose and Description

The purpose of this activity is to:

- Improve vision to maintain safe sight distances, visibility of signs, markers and animals within the road reserve.
- Improve the general appearance of the roadside.
- Reduce the need for weed and brush control.
- Prevent roots from penetrating the surface and pavement layer.
- Reduce the effort required to maintain roadside ditches and shoulders.
- Ensure healthy growth of landscaped areas.
- Reduce fire risk during dry season.

The activity includes, mowing of grass and vegetation by hand-mower and/or brush cutter (or other hand equipment) in medians, drains and around roadside furniture or elsewhere as required. Grass cutting shall be done within the entire road reserve or to such other width as determined by the Engineer. Grass shall be defined as any plant having a girth of not more than 60 mm measured at a height of 300 mm above ground level.

### Service Quality Standard

- Caution must be taken not to remove the grass roots on areas where the grass is needed for erosion protection, i.e. on side slopes, in drains etc.
- The grass shall be cut evenly and to a maximum height of approximately 50 mm above ground level. Two types of standards apply for grass cutting:
  - i) Within the entire road reserve.
  - ii) Within width W m from the shoulder breakpoint on both sides of the road, and on danger points (inside sharp curves, junctions, bus stops, lay-byes and railway crossings), the grass must not exceed height H mm at any time throughout the year.
  - iii) Shoulders and medians not more than 150 mm.
- Vegetation shall be controlled in accordance with the threshold levels and response times given in the table below. Response time for Grass Cutting shall be until when cutting operations start.

### Threshold Level - Response Time

Service Level A		Service Level B		Service Level C	
Threshold Level	Response Time	Threshold Level	Response Time	Threshold Level	Response Time
Road Reserve:		Road Reserve:		Road Reserve:	
i) H = 500	2 w	i) H = 600	3 w	i) H = 700	4 w
ii) W = 12; H = 300	2 w	ii) W = 6; H = 300	3 w	ii) W = 6; H = 500	4 w
Shoulders, medians:		Shoulders, medians:		Shoulders, medians:	
H = 150	2 w	H = 150	3 w	H = 250	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8110
<b>Activity</b>	Creeper Grass Removal	Code :	8112

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Creeper grass close to or within roadway.</p> <p><b>Main Causes:</b> Creeper grass has been allowed to grow unchecked.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Surface water can pond at the edge of the carriageway and weaken the pavement structure.</li> <li>• Silt accumulates at the edge of the carriageway.</li> <li>• Pavement damage by creeper grass.</li> <li>• Reduce available roadway width.</li> <li>• Water ingress in the pavement structure.</li> <li>• Unsightly appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Improve the general appearance of the roadside.</li> <li>• Reduce the need for weed and brush control.</li> <li>• Prevent roots from penetrating the surface and pavement layer.</li> <li>• Reduce the effort required to maintain roadside ditches and shoulders.</li> <li>• Ensure healthy growth of landscaped areas.</li> </ul> <p>The activity includes removal of couch (creeper) grass and other harmful weed on the shoulders on a 500 mm wide strip along the edge of the roadway from the shoulder break point to prevent the grass from establishing itself and roots penetrating the surface and pavement layer. It includes also the unsurfaced portion of surfaced shoulders and medians.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• No creeper grass shall be allowed closer than L m from the roadway edge. In areas where couch grass or other harmful weeds is growing, it shall be removed regularly or as directed to prevent it from spreading. Alternatively the grass or harmful weed may be kept in check by use of herbicides at the approval of the Engineer.</li> <li>• Burning of grass shall not be allowed.</li> <li>• Creeper grass shall be controlled in accordance with the threshold levels and response times given in the table below:</li> </ul>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
L = 0,5	2 w	L = 0,5	3 w	L = 0,5	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8110
<b>Activity</b>	Bush Clearing	Code :	8113

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Unwanted small trees and bush within road reserve.</p> <p><b>Main Causes:</b> Unwanted vegetation has been allowed to grow unattended.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduce sight distance.</li> <li>• Reduce visibility of signs and markers.</li> <li>• Reduce visibility from the road of animals within the road reserve.</li> <li>• Unsightly appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Improve visibility to maintain safe sight distances, visibility of signs, markers and animals within the road reserve.</li> <li>• Improve the general appearance of the roadside.</li> <li>• Reduce the need for weed and brush control.</li> <li>• Prevent roots from penetrating the surface and pavement layer.</li> </ul> <p>The activity includes the removal of bushes on shoulders, in side drains and the road reserve to maintain safe sight distance, visibility of signs, markers and animals within the road reserve, and to maintain a pleasing appearance of the road side areas. Bush shall be defined as any plant with girth more than 60 mm but less than or equal to 300 mm measured at 300 mm from the ground. Bush clearing shall include removal of stumps and root system to a minimum depth of 500 mm from the ground so as to prevent their re-growth.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• No bushes shall be allowed to grow in drains, on shoulders, medians and dangers spots (inside sharp curves, junctions, bus stops, lay-byes and railway crossings).</li> <li>• At any time through the year cut and remove bushes from the affected sections if more than N (number) bushes per 100 m road, or any single bush higher than H m.</li> <li>• All bushes cleared shall be removed with stumps and roots to prevent re-growth.</li> <li>• Bush shall be cleared in accordance with the threshold levels and response times given in the table below:</li> </ul>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
N = 5, H = 0,5	2 w	N =10, H = 0,75	3 w	N = 20, H = 1,0	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8110
<b>Activity</b>	Trees Trimming	Code :	8114

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Branches of trees within road reserve affect sight distance.</p> <p><b>Main Causes:</b> Unwanted branches of trees have been allowed to grow unattended.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced sight distance.</li> <li>• Reduced visibility of signs and markers.</li> <li>• Reduced visibility from the road of animals within the road reserve.</li> <li>• Unsightly appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Improve visibility to maintain safe sight distances, visibility of signs, markers and animals within the road reserve.</li> <li>• Improve the general appearance of the roadside.</li> <li>• Ensure healthy growth of trees planted for purpose of landscaping</li> </ul> <p>The activity includes trimming of trees when required to control growth and to remove dead or damaged branches.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Trees within road reserve must be protected as necessary.</li> <li>• Headroom clearance shall be minimum 5.00 m.</li> <li>• Lateral clearance from shoulder breakpoint shall be minimum 2.0 m on straight road sections, and sufficient not to reduce specified sight distance on the inside of a bend.</li> <li>• Branches that affect sight distance or the open vista, and withered or dead branches and limbs that will hinder the healthy normal growth of trees, shall be removed as designated by the Engineer. Cuts shall be made flush at the collar of the supporting trunk or limb.</li> <li>• Trees shall be trimmed in accordance with the threshold levels and response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Branches affect sight distance	3 w	Branches affect sight distance	4 w	Branches affect sight distance	6 w
Headroom and lateral clearance too small	3 w	Headroom and lateral clearance too small	4 w	Headroom and lateral clearance too small	6 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8110
<b>Activity</b>	Trees Removal	Code :	8115

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Unwanted trees within road reserve.</p> <p><b>Main Causes:</b> Trees have been allowed to grow unchecked.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced sight distance.</li> <li>• Reduced visibility of signs and markers.</li> <li>• Reduced visibility from the road of animals and other obstacles within the road reserve.</li> <li>• Unsightly appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Improve visibility to maintain safe sight distances, visibility of signs, markers and animals within the road reserve.</li> <li>• Improve the general appearance of the roadside.</li> <li>• Create open areas.</li> </ul> <p>The activity includes felling, removal of stumps and disposal of undesirable trees within the road reserve. A tree is defined as a plant with a girth of more than 300 mm measured 300 mm from the ground.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Trees which are allowed to grow within the road reserve must be protected as necessary.</li> <li>• Trees and stumps shall be cut in such a manner that remaining stumps, if allowed to remain, are not higher than 150 mm above the ground. Loose roots more than 25 mm in diameter and more than 300 mm in length shall be removed. Only those living trees and shrubs selected by the Engineer shall be removed. Trees to be removed shall be felled in a manner that will not damage the trees and shrubs to be preserved.</li> <li>• Trees shall be removed in accordance with the threshold levels and response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Undesirable trees within road reserve	4 w	Undesirable trees within road reserve	6 w	Undesirable trees within road reserve	8 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8110
<b>ACTIVITY</b>	Morama Tuber Removal	Code :	8116

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Morama tuber growing under shoulder or carriageway.</p> <p><b>Main Causes:</b> Morama tubers have been allowed to grow unchecked.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to shoulder and pavement structure.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Prevent that morama tubers undermine the road structure.</li> <li>• Excavation remaining from the removal of morama tubers shall be backfilled with suitable material and compacted in accordance with MSSRBW 8116.3.</li> <li>• All debris shall be disposed as approved by the Engineer.</li> </ul> <p>The activity includes selective excavation and removal of morama tubers and their root system to a minimum depth of 500 mm below the natural ground level to prevent re-growth.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• There shall be no morama tubers growing under shoulders or carriageway.</li> <li>• Morama tubers shall be removed within the response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Morama tuber within roadway	2 w	Morama tuber within roadway	3 w	Morama tuber within roadway	4 w
Morama tuber outside roadway	4 w	Morama tuber outside roadway	6 w	Morama tuber outside roadway	8 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8110
<b>Activity</b>	De-stumping	Code :	8117

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Tree stumps in the road reserve.</p> <p><b>Main Causes:</b> Left from previous felling of trees.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Unwanted re-growth of bush and trees.</li> <li>• Hindering mechanical mowing.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Remove the root system of trees to a depth of min. 500 mm to prevent re-growth and thereby prolonging the bush clearing cycles.</li> <li>• De-stumping shall be done within the entire road reserve or to such other width as determined by the Engineer.</li> <li>• Removal of the stumps shall be by physical removal, and stumps shall be disposed in designated areas. After removal of the stumps, the resulting hole shall be backfilled to the level of the natural ground.</li> <li>• The backfill material shall be taken from immediately around the stump and lightly compacted.</li> </ul> <p>The activity includes excavation and removal of stumps and roots of bushes/trees which have been left within the road reserve from previous bush clearing activities.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• No stumps shall be left in the road reserve area.</li> <li>• De-stumping shall be carried out specified in MSSRBW 8117.and in accordance with the threshold levels and response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Stumps in road reserve	6 w	Stumps in road reserve	8 w	Stumps in road reserve	10 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	ANIMALS CONTROL	CODE:	8120

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8121 Fence Repair</li> <li>8122 Gate Repair</li> <li>8123 Cattle Grid Repair</li> <li>8124 Keeping Animals off Road Reserve</li> <li>8125 Moles Control</li> <li>8129 Other Animals Control</li> </ul> <p>Activity 8129 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8121 to 8129.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8120 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Animals in road reserve	Without delay	Animals in road reserve	Without delay	Animals in road reserve	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	ANIMALS CONTROL	CODE:	8120
<b>Activity</b>	Fence Repair	Code :	8121

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damage to fence, fence missing, broken or collapsed.</p> <p><b>Main Causes:</b> Fence damaged by animals or people, and left unattended, accidental damage, vandalism, maintenance neglected.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Animals access into road reserve and cause accidents.</li> <li>• Hazard to people and animals.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Keep fences along the road reserve in good repair so as not to allow animals to enter, and also to maintain fences on top of high cuts to safeguard people and animals.</li> </ul> <p>The activity includes re-erecting/replacing fence posts, repairing fence wires, repairing/replacing droppers and other minor repairs that may be carried out while keeping intact the function of the fence.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Fences shall be in good repair without defects.</li> <li>• The repaired fences shall be plumb, taut, true to line and ground contour, with all posts, standards and stays firmly set. The height of the lower fencing wire above the ground at posts and standards shall not vary by more than 25 mm from the original position.</li> <li>• No openings through or under the fence shall be allowed.</li> <li>• Fences shall be repaired in accordance with the threshold levels and response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged fence; safety hazard	Without delay	Damaged fence; safety hazard	Without delay	Damaged fence; safety hazard	Without delay
Damaged fence; not fulfilling function	2 w	Damaged fence; not fulfilling function	4 w	Damaged fence; not fulfilling function	6 w
Damaged fence; but fulfilling function	4 w	Damaged fence; but fulfilling function	6 w	Damaged fence; but fulfilling function	8 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8120
<b>Activity</b>	Gate Repair	Code :	8122

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damage to gates.</p> <p><b>Main Causes:</b> Gates damaged by animals, people, vehicles or other natural causes.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Animals allowed access into road reserve.</li> <li>• Hazard to people and animals.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Keep gates in fences along the road reserve in good repair so as not to allow animals to enter, and also to maintain gates in fences on top of high cuts to safeguard people and animals.</li> </ul> <p>The activity includes re-erecting/replacing fence gates, repairing gate wires, repairing/replacing gate hinges and other minor repairs that may be carried out while keeping intact the function of the gates.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Gates shall be in good repair without visible defects.</li> <li>• The repaired gate shall be plumb, taut, true to line and ground contour, with all posts, standards and stays firmly set.</li> <li>• Defects on gates shall be repaired in accordance with the response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged gate; safety hazard	Without delay	Damaged gate; safety hazard	Without delay	Damaged gate; safety hazard	Without delay
Damaged gate; not fulfilling function	2 w	Damaged gate; not fulfilling function	4 w	Damaged gate; not fulfilling function	4 w
Damaged gate; but fulfilling function	4 w	Damaged gate; but fulfilling function	6 w	Damaged gate; but fulfilling function	6 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8120
<b>Activity</b>	Cattle Grid Repair	Code :	8123

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damage to cattle grid.</p> <p><b>Main Causes:</b> Accumulation of debris, flooding, traffic action.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Animals allowed access to the roadway.</li> <li>• Hazard to people and animals.</li> <li>• Water drainage problems.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Prevent domestic and wild animals from entering the road reserve and roadway.</li> <li>• It includes reinstalling the cattle grid and the asphalt pavement surface patching, or spot gravelling of the disturbed area.</li> </ul> <p>The activity includes cleaning out the trench, inspecting the grid and supporting concrete structure and performing minor repairs, such as re-welding loose rails and recasting of damaged concrete.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The cattle grid shall be fully functional without defects.</li> <li>• There shall be a smooth transition from the roadway to the cattle grid level.</li> <li>• Defects on cattle grids shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged grid; safety hazard	Without delay	Damaged grid; safety hazard	Without delay	Damaged grid; safety hazard	Without delay
Damaged grid; not fulfilling function	2 w	Damaged grid; not fulfilling function	4 w	Damaged grid; not fulfilling function	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8120
<b>Activity</b>	Keeping Animals off Road Reserve	Code :	8124

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Animals roaming within road reserve.</p> <p><b>Main Causes:</b> Unfenced road reserve or damaged fences and /or gates or cattle grids.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>Animals access the road reserve and roadway.</li> <li>Hazard to road users and animals.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>Prevent animals from entering the road reserve and roadway.</li> <li>Keeping gates closed and secured at all times.</li> <li>Driving animals at least 100 m outside the road reserve.</li> </ul> <p>The activity includes keeping the road reserve clear of straying animals including cattle, donkeys, horses, goats, sheep, dogs and any wild animals. Fences shall always be intact and gates shall be closed properly at all times to be effective in keeping animals out of the road reserve.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>The road reserve shall be largely free of roaming domestic animals or any wild animals.</li> <li>Animals shall be kept off the road reserve in accordance with the response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Animals within road reserve	Without delay	Animals within road reserve	Without delay	Animals within road reserve	Without delay



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	VEGETATION CONTROL	CODE:	8120
<b>Activity</b>	Moles Control	Code :	8125

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Excavations in pavement layers or subgrade by moles.</p> <p><b>Main Causes:</b></p> <ul style="list-style-type: none"> <li>• Moles making burrows in pavement structure.</li> <li>• Moles allowed to enter roadway.</li> </ul> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Parts of pavement structure might collapse.</li> <li>• Hazard to road users.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Prevent moles from establishing their habitat within the roadway and road reserve thereby making burrows.</li> </ul> <p>The activity includes the control of moles to keep them away from the roadway, remove moles that have made burrows within the roadway or the road reserve, and reinstate the pavement structure.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Only approved chemicals shall be used.</li> <li>• Moles shall not be allowed to occupy the roadway or the road reserve close to the road.</li> <li>• Moles shall be controlled in accordance with the response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Moles within the roadway	1 w	Moles within the roadway	2 w	Moles within the roadway	3 w
Moles within road reserve	4 w	Moles within road reserve	6 w	Moles within road reserve	8 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	REST AREA MAINTENANCE	CODE:	8130

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8131 Rest Area Cleaning</li> <li>8132 Rest Area Facilities Repair</li> <li>8133 Rest Area Reshaping</li> <li>8134 Rest Area Regravelling</li> <li>8135 Rest Area Resealing</li> <li>8136 Rest Area Fogspray</li> <li>8137 Rest Area Bituminous Overlay</li> <li>8139 Other Rest Area Maintenance</li> </ul> <p>Activity 8139 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8131 to 8139.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8130 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Rest area shall be clean, tidy and in good repair	2 w	Rest area shall be clean, tidy and in good repair	3 w	Rest area shall be clean, tidy and in good repair	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	REST AREA MAINTENANCE	CODE:	8130
<b>Activity</b>	Rest Area Cleaning	Code :	8131

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Untidy rest area, bus stops and lay-byes, damages to facilities, dirt on facilities, litter on rest area.</p> <p><b>Main Causes:</b> Inconsiderate road users, rubbish bin overfilled, litter collection and cleaning inadequate.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Road users discontent.</li> <li>• Hazard to people and animals.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Provide road users with adequate, functional and pleasing rest areas along the roads.</li> <li>• Ensure that rest areas appear as clean and inviting and safe places for the travelling public.</li> </ul> <p>The activity includes cleaning and servicing of all aspects of rest areas, bus stops and lay-byes necessary for the safety and convenience of the public.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Rest areas, bus stops and lay-byes and their immediate surrounding areas shall generally be clean and have a pleasing appearance.</li> <li>• Rest areas, bus stops and lay-byes shall be cleaned in accordance with the response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Untidy appearance	1 w	Untidy appearance	3 w	Untidy appearance	6 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	REST AREA MAINTENANCE	CODE:	8130
<b>Activity</b>	Rest Area Facilities Repair	Code :	8132

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged rest areas, bus stops and lay-byes facilities like shelters, toilets, buildings, furniture etc.</p> <p><b>Main Causes:</b> Misuse and inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Road users discontent.</li> <li>• Hazard to road users.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Provide road users with adequate, functional and pleasing rest areas along the roads.</li> <li>• Ensure that rest areas are functioning with an inviting appearance for the travelling public.</li> </ul> <p>The activity includes repair of facilities in rest areas, bus stops and lay-byes, such as tables, benches, toilets, buildings and shelters, necessary for the convenience of the public.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Rest areas, bus stops and lay-byes facilities shall be fully functional and in good repair.</li> <li>• Rest area facilities shall be repaired in accordance with the response times given in the table below:</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged rest area facilities	2 w	Damaged rest area facilities	4 w	Damaged rest area facilities	6 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	REST AREA MAINTENANCE	CODE:	8130
<b>Activity</b>	Rest Area Reshaping	Code :	8133

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Accumulation of surface degradations such as loss of crossfall, corrugations, potholes or rutting on rest areas, bus stops and lay-byes.</p> <p><b>Main Causes:</b> Substandard surface material, severe weather conditions, lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced driving comfort.</li> <li>• Reduced access.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Reinstate correct profile on unpaved rest areas, bus stops and lay-byes.</li> <li>• Improve riding conditions.</li> </ul> <p>The activity consists of light and medium grading of the rest area, bus stop and lay-bye and its access roads, including necessary patching of potholes or filling of depressions. It includes watering and compaction. (Light and medium grading do not include scarifying or addition of imported gravel/material from outside the work site to build up the existing material).</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The completed treatment shall provide a smooth, stable and safe rest area, bus stop and lay-bye surface.</li> <li>• Road rut depth or corrugation amplitude on the travelled areas shall not be more than A mm.</li> <li>• Other surface degradations, such as potholes or erosions, shall not have a maximum dimension exceeding L mm.</li> <li>• Defective rest areas bus stops and lay-byes shall be corrected in accordance with threshold levels and response times given in the table below. For Rest Area Reshaping the response time shall be until reshaping operations start.</li> </ul>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Corrugation or rut depth: A = 35	2 w	Corrugation or rut depth: A = 35	3 w	Corrugation or rut depth: A = 35	4 w
Other surface degradations: L = 200	2 w	Other surface degradations: L = 200	3 w	Other surface degradations: L = 200	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	REST AREA MAINTENANCE	CODE:	8130
<b>Activity</b>	Rest Area Regravelling	Code :	8134

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Excessive loss of gravel.</p> <p><b>Main Causes:</b> Reduced gravel surface thickness due to traffic and adverse environmental conditions.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced driving comfort.</li> <li>• Reduced pavement strength.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Reinstate correct profile, if required as described in Activity 8133 to rest areas, bus stops and lay-byes.</li> </ul> <p>The activity consists of addition of imported material as required to the rest area, bus stop and lay-bye surface, placing and spreading approved material to reinstate the correct profile, including removal of any vegetation and preparation of the existing formation, watering and compaction.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The completed treatment shall provide a smooth, stable and safe rest area, bus stop and lay-bye surface.</li> <li>• The gravel thickness shall not be less than T mm.</li> <li>• Defective rest areas, bus stops and lay-byes shall be regravelled in accordance with threshold levels and response times given in the table below. For Rest Area Regravelling the response time shall be until regravelling operations start.</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
Minimum gravel thickness: T = 60	4 w	Minimum gravel thickness: T = 60	6 w	Minimum gravel thickness: T = 60	8 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	REST AREA MAINTENANCE	CODE:	8130
<b>Activity</b>	Rest Area Resealing	Code :	8135

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Lean, uneven surface texture.</p> <p><b>Main Causes:</b> Worn out surface, loss of binder, loss of aggregate, inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced riding comfort.</li> <li>• Ingress of water.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Slow down further deterioration of the surface and restore driving conditions.</li> </ul> <p>The activity includes supplying and applying an approved seal to the surface of bituminous paved rest areas, bus stops and lay-byes to prevent ravelling and to close surfacing cracks. The type of seal shall be as directed by the Engineer. Where a surface seal covers existing pavement markings, the Activity will also include the application of temporary pavement markings (spotting).</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The total surface degradation (patched and unpatched potholes, ravelling and cracking) shall not exceed P percent of the total rest area.</li> <li>• Resealing of rest areas shall be carried out as directed within the response times given in the table below, or as directed by the Engineer. For Rest Area Resealing the response time shall be until resealing operations start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Deteriorated area: P = 10	4 w	Deteriorated area: P = 10	6 w	Deteriorated area: P = 10	8 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	REST AREA MAINTENANCE	CODE:	8130
<b>Activity</b>	Rest Area Fogspray	Code :	8136

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Lean, hungry and uneven surface texture.</p> <p><b>Main Causes:</b> Worn out surface, oxidation of binder.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced riding comfort.</li> <li>• Ingress of water.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Bind together and hold in place surfacing aggregate that would otherwise ravel and be dislodged by traffic action.</li> <li>• To slow down further deterioration of the surface and restore driving conditions.</li> </ul> <p>The activity includes supplying and applying a fogspray to the old surfacing on rest areas, bus stops and lay-byes. Where the fogspray cover existing road markings, they should be repainted and or replaced.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Rest Area Fogspray shall be carried out within the response times given in the table below, or as directed by the Engineer, ascertained by a visual condition survey. For Rest Area Fogspray the response time shall be until resealing operations start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Surface lean and "hungry" in the opinion of the Engineer	4 w	Surface lean and "hungry" in the opinion of the Engineer	6 w	Surface lean and "hungry" in the opinion of the Engineer	8 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	REST AREA MAINTENANCE	CODE:	8130
<b>Activity</b>	Rest Area Bituminous Overlay	Code :	8137

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Deteriorated surface and pavement defects.</p> <p><b>Main Causes:</b> Worn out surface, loss of aggregate, inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Pavement structure deterioration.</li> <li>• Reduced riding comfort.</li> <li>• Traffic hazard.</li> <li>• Ingress of water.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Slow down further deterioration of the surface and/or the pavement structure to restore traffic safety and trafficability.</li> </ul> <p>The activity includes supplying and applying a bituminous overlay on rest areas, bus stops and lay-byes in accordance with SSRBW SERIES 4000: ASPHALT PAVING AND BITUMINOUS SURFACING.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Rest Area Bituminous Overlay shall be carried out within the response times given in the table below, or as directed by the Engineer, ascertained by a visual condition survey. For Rest Area Bituminous Overlay the response time shall be until overlay operations start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Deteriorated surface and pavement defects requiring overlay according to the Engineer	4 w	Deteriorated surface and pavement defects requiring overlay according to the Engineer	6 w	Deteriorated surface and pavement defects requiring overlay according to the Engineer	6 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LITTER CONTROL AND OBSTACLES REMOVAL	CODE:	8140

<b>Defects, Main Causes and Effects</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8141 Litter Collection and Removal</li> <li>8142 Obstacles Collection and Removal</li> <li>8143 Dead Animals Removal</li> <li>8144 Abandoned Vehicles and Scrap Removal</li> <li>8145 Anthills Removal</li> <li>8146 Illegal Signs and Other Encroachments Removal</li> <li>8149 Other Litter Control and Obstacles Removal</li> </ul> <p>Activity 8149 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8141 to 8149.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8140 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Obstacles on the roadway	Without delay	Obstacles on the roadway	Without delay	Obstacles on the roadway	Without delay
Litter and other obstacles within the road reserve	1 w	Litter and other obstacles within the road reserve	2 w	Litter and other obstacles within the road reserve	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LITTER CONTROL AND OBSTACLES REMOVAL	CODE:	8140
<b>Activity</b>	Litter Collection and Removal	Code :	8141

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Litter in road reserve.</p> <p><b>Main Causes:</b> Inconsiderate road users, inadequate litter collection routines, wind blown litter, storm water transporting debris.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Road user's discontent.</li> <li>• Hazard to people.</li> <li>• Negative environmental impact.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain a pleasing appearance within road reserve and on roadway for the convenience of the public.</li> <li>• Avoid blocking of drainage facilities.</li> </ul> <p>The activity includes collection and removal of litter from the road reserve area to maintain a pleasing appearance of these areas.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All litter and other disposed objects shall be regularly collected and removed from within the entire road reserve.</li> <li>• No litter potentially hazardous to traffic shall remain on the roadway or remain in the vicinity of sensitive locations, such as water sources, hospitals, school, heritage sites etc.</li> <li>• The road reserve areas shall be generally clean and have a pleasing appearance. There shall be no litter or debris visible from the road following a completed collection of litter along the road in accordance with the response times and frequencies indicated in the table below, or as otherwise directed by the Engineer for particularly sensitive areas.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Litter potentially hazardous to traffic or in sensitive areas	Without delay	Litter potentially hazardous to traffic or in sensitive areas	Without delay	Litter potentially hazardous to traffic or in sensitive areas	Without delay
Litter in road reserve	1 w	Litter in road reserve	2 w	Litter in road reserve	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LITTER CONTROL AND OBSTACLES REMOVAL	CODE:	8140
<b>Activity</b>	Obstacles Collection and Removal	Code :	8142

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Large obstacles in road reserve and on roadway.</p> <p><b>Main Causes:</b> Wind and storm water forces and slippage from moving trucks.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic safety hazard.</li> <li>• Road users discontent.</li> <li>• Health hazard to road users.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain traffic safety.</li> <li>• Maintain a pleasing appearance within road reserve and on roadway for the convenience of the public.</li> <li>• Protect the public from health hazards.</li> </ul> <p>The activity includes collection and removal of obstacles, defined as any object or material occurring on the roadway or within the road reserve which interfere with the flow of traffic and necessitates immediate removal. Such obstacles include but are not limited to the following: spilt substances, fallen trees or branches, rock fall, loose aggregate and sand or broken signs. It does not include removal of smaller obstacles, which shall be done in connection with the routine litter collection or other activities, as directed by the Engineer.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The road surface and shoulders shall be kept in a safe and obstruction-free condition.</li> <li>• The road reserve shall be kept clear of debris.</li> <li>• Obstacles shall not be left to cause unnecessary hazards to traffic safety or public health.</li> <li>• Obstacles shall be collected and removed in accordance with the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Obstacles on roadway	Without delay	Obstacles on roadway	Without delay	Obstacles on roadway	Without delay
> 10 l spilled material on the roadway	Without delay	> 10 l spilled material on the roadway	2 d	> 10 l spilled material on the roadway	2 d
Obstacles within road reserve being a traffic hazard	2 d	Obstacles within road reserve being a traffic hazard	1 w	Obstacles within road reserve being a traffic hazard	1 w
Obstacles in road reserve	1 w	Obstacles in road reserve	2 w	Obstacles in road reserve	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LITTER CONTROL AND OBSTACLES REMOVAL	CODE:	8140
<b>Activity</b>	Dead Animals Removal	Code :	8143

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Dead animals in road reserve or on roadway.</p> <p><b>Main Causes:</b> Natural causes or animals hit by vehicle.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic safety hazard.</li> <li>• Road users discontent.</li> <li>• Health hazard to people.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain traffic safety.</li> <li>• Maintain a pleasing appearance within road reserve and on roadway for the safety of the public.</li> <li>• Protect the public from health hazards.</li> </ul> <p>The activity includes removal of dead animals from the roadway or the road reserve, reporting to the appropriate authority, and disposal at designated and approved places.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The roadway and the road reserve shall be kept clear of dead animals.</li> <li>• Dead animals shall be removed within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Dead animal on roadway	Without delay	Dead animal on roadway	Without delay	Dead animal on roadway	Without delay
Dead animal in road reserve	Without delay	Dead animal in road reserve	1 d	Dead animal in road reserve	2 d

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LITTER CONTROL AND OBSTACLES REMOVAL	CODE:	8140
<b>Activity</b>	Abandoned Vehicles and Scrap Removal	Code :	8144

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Abandoned vehicles or pieces of scrap left in road reserve or on roadway.</p> <p><b>Main Causes:</b> Traffic accidents or people leaving vehicles or scrap for convenience.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic safety hazard.</li> <li>• Road users discontent.</li> <li>• Health hazard to people.</li> <li>• Negative environmental impact.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain traffic safety.</li> <li>• Maintain a pleasing appearance within road reserve and on roadway for traffic safety and environmental concern.</li> </ul> <p>The activity includes removal of abandoned vehicles or pieces of scrap from the roadway or the road reserve.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• There shall be no abandoned vehicles or pieces of scrap on the road or within the road reserve.</li> <li>• The police shall be notified about any abandoned vehicles or pieces of scrap.</li> <li>• Abandoned vehicles or pieces of scrap shall be removed within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Abandoned vehicles or scrap on roadway	Without delay	Abandoned vehicles or scrap on roadway	Without delay	Abandoned vehicles or scrap on roadway	Without delay
Abandoned vehicles or scrap in road reserve	3 d	Abandoned vehicles or scrap in road reserve	1 w	Abandoned vehicles or scrap in road reserve	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LITTER CONTROL AND OBSTACLES REMOVAL	CODE:	8140
<b>Activity</b>	Anthills Removal	Code :	8145

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Anthills on shoulder or within the road reserve.</p> <p><b>Main Causes:</b> Anthills allowed to be built, termite action.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Undermining of the road structure.</li> <li>• Traffic safety hazard.</li> <li>• Reduced visibility.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Prevent ants from undermining the road structure.</li> <li>• Prevent ingress of water.</li> <li>• Maintain traffic safety.</li> <li>• Maintain a pleasing appearance within road reserve for the convenience of the public.</li> </ul> <p>The activity includes removal of visible parts of anthills and a minimum of 0.75 m below ground within the road reserve, and killing of ants by use of approved pesticide.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• There shall be no visible anthills within the road reserve.</li> <li>• Anthills closer to the shoulder breakpoint than 6 metres shall be removed within the response times given in the table below.</li> <li>• Anthills shall be removed within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Anthills closer than 6 metres from shoulder breakpoint	Without delay	Anthills closer than 6 metres from shoulder breakpoint	1 w	Anthills closer than 6 metres from shoulder breakpoint	2 w
Anthills visible within road reserve	2 w	Anthills visible within road reserve	3 w	Anthills visible within road reserve	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LITTER CONTROL AND OBSTACLES REMOVAL	CODE:	8140
<b>Activity</b>	Illegal Signs and Other Encroachments Removal	Code :	8146

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Illegal signs, buildings of any type, obstructions, offensive material or material causing unpleasant smell, fire, digging, planting or sowing or other encroachment left within road reserve, or affecting the road reserve left within the road reserve.</p> <p><b>Main Causes:</b> Unauthorised placing and leaving of illegal signs, buildings of any type, obstructions, offensive material or material causing unpleasant smell, fire, digging, planting or sowing or other encroachment left within road reserve, or affecting the road reserve.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic safety hazard.</li> <li>• Road users discomfort.</li> <li>• Health hazard to people.</li> <li>• Negative environmental impact.</li> <li>• Obstructing non-motorized traffic.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain traffic safety.</li> <li>• Maintain a pleasing appearance within road reserve and for environmental preservation.</li> <li>• Protect the public from health hazards.</li> </ul> <p>The activity includes removal of illegal signs, buildings of any type, obstructions, offensive material or material causing unpleasant smell, fire, digging, planting or sowing or other encroachment left within road reserve, or affecting the road reserve. It also includes notification to relevant owner or person responsible for placing such signs or encroachments, follow legal procedure for removal, incl. reporting to appropriate authority and disposal at designated and approved places.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• There shall be no illegal signs or other encroachment within the road reserve.</li> <li>• The relevant owner or person responsible for the sign or encroachment and the appropriate road authority shall be notified about any illegal signs or other encroachment within the road reserve for necessary action.</li> <li>• Illegal signs or other encroachment shall be removed within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Illegal signs or encroachment on roadway, footpath and cycle path	Without delay	Illegal signs or encroachment on roadway, footpath and cycle path	Without delay	Illegal signs or encroachment on roadway, footpath and cycle path	Without delay
Illegal signs or encroachment in road reserve	3 d	Illegal signs or encroachment in road reserve	1 w	Illegal signs or encroachment in road reserve	2 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	SLOPES MAINTENANCE	CODE:	8150

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8151 Slope Erosion Prevention</li> <li>8152 Slope Erosion Repair</li> <li>8159 Other Slopes Maintenance</li> </ul> <p>Activity 8159 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8151 to 8159.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8150 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Visible slope erosion	1 w	Visible slope erosion	2 w	Visible slope erosion	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	SLOPES MAINTENANCE	CODE:	8150
<b>Activity</b>	Slope Erosion Prevention	Code :	8151

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Signs of potential instability of slopes; slopes exposed to excess of concentrated water run off.</p> <p><b>Main Causes:</b> Unstable material in slopes, ingress of water, steep slopes, slope material removed.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Slopes erosion.</li> <li>• Blockage of roadway by erosion debris.</li> <li>• Traffic safety hazard to road users.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Prevent erosion of slopes.</li> <li>• Maintain integrity of the road structure.</li> <li>• Avoid potential hazards to road users.</li> </ul> <p>The activity includes all works to prevent excess concentration of water run off on the slopes, provide erosion protection and to repair potential stability problems. It also includes work to prevent accumulation of moving sand on roadway. Fallen slope material classified as "emergency"; i.e. the quantity of the material is above 100 m<sup>3</sup> or where the material slide blocks all lanes and interrupts the road traffic, shall be attended to without delay in accordance with procedures for emergency works in Section 8800</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Cut and embankment slopes shall be stable and free of defects that can present a potential danger to pedestrians and traffic.</li> <li>• Defects shall be attended to within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Unstable embankment and/or cut	Without delay	Unstable embankment and/or cut	Without delay	Unstable embankment and/or cut	Without delay
Missing slope material	2 w	Missing slope material	4 w	Missing slope material	6 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	SLOPES MAINTENANCE	CODE:	8150
<b>Activity</b>	Slope Erosion Repair	Code :	8152

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Eroded slope and unwanted erosion material deposited on the shoulder or roadway.</p> <p><b>Main Causes:</b> Unstable material in slopes, ingress of water, too steep slopes, slope material removed.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Further slope erosion.</li> <li>• Blockage of roadway by erosion debris.</li> <li>• Safety hazard for road users.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Repair eroded slopes.</li> <li>• Re-establish the full functionality of the slope.</li> <li>• Avoid potential hazards to road users.</li> </ul> <p>The activity includes all works to repair erosion on slopes and damaged erosion protection works.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Cut and embankment slopes shall be stable and free of defects that can present a potential danger to road users.</li> <li>• Fallen slope material on shoulders or roadway shall be removed within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Fallen slope material < 100 m <sup>3</sup> on roadway	Without delay	Fallen slope material < 100 m <sup>3</sup> on roadway	Without delay	Fallen slope material < 100 m <sup>3</sup> on roadway	Without delay
Slope erosion	1 w	Slope erosion	2 w	Slope erosion	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LANDSCAPED AREAS MAINTENANCE	CODE:	8160

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8161 Trees, Grass and Flowers Planting</li> <li>8162 Trees, Grass and Flowers Watering</li> <li>8163 Trees, Grass and Flowers Cutting and Trimming</li> <li>8164 Special Features Maintenance</li> <li>8165 Landscaped Areas Cleaning</li> <li>8169 Other Landscaped Areas Maintenance</li> </ul> <p>Activity 8169 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8161 to 8169.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8160 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Unattractive appearance of landscaped areas	1 w	Unattractive appearance of landscaped areas	2 w	Unattractive appearance of landscaped areas	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LANDSCAPED AREAS MAINTENANCE	CODE:	8160
<b>Activity</b>	Trees, Grass and Flowers Planting	Code :	8161

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Missing or damaged grass, flowers and other plants in landscaped areas.</p> <p><b>Main Causes:</b> Pests, drought, vandalism, accidental damage, wind or water damage, inadequate care, ageing.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Not pleasing appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance the appearance of road reserve and rest areas.</li> <li>• Protect against wind, sun and headlight glare.</li> </ul> <p>The activity includes the supply, replanting and maintenance of trees, grass and flowers, including fertilizing, mulching and weeding of trees and grass that have either withered or been destroyed in landscaped areas.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Trees, Grass and Flower Planting shall be in accordance with the design.</li> <li>• Trees, grass and flowers shall have a pleasing appearance.</li> <li>• Defects shall be attended to within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged vegetation	2 w	Damaged vegetation	3 w	Damaged vegetation	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LANDSCAPED AREAS MAINTENANCE	CODE:	8160
<b>Activity</b>	Trees, Grass and Flowers Watering	Code :	8162

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Drought stress.</p> <p><b>Main Causes:</b> Too little water, newly established vegetation.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Growth reduced.</li> <li>• Landscaped areas become unattractive.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance the appearance of road reserve and rest areas.</li> <li>• Ensure a healthy growth.</li> <li>• Avoid draught conditions for planted trees, grass and flowers in landscaped areas.</li> </ul> <p>The activity includes all works in connection with watering of grass, flowers and any other plant in landscaped areas.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Planted trees, grass and flowers shall have no signs of drought during the establishment period when a high level of care is required or during the ensuing perpetual care period.</li> <li>• Trees, Grass and Flowers Watering shall be carried out within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Drought stress	1 d	Drought stress	2 d	Drought stress	2 d

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LANDSCAPED AREAS MAINTENANCE	CODE:	8160
<b>Activity</b>	Trees, Grass and Flowers Cutting and Trimming	Code :	8163

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damage on trees, grass and flowers, obscured traffic signs, impaired sight distance.</p> <p><b>Main Causes:</b> Trees, grass and flowers allowed to grow without trimming, injudicious planting.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Growth reduced.</li> <li>• Landscaped areas become unattractive.</li> <li>• Obscure sight distance.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance the appearance of road reserve and rest areas.</li> <li>• Ensure a healthy growth of trees, grass and flowers.</li> <li>• Keep trees, grass and flowers neat and tidy and avoid that they become an obstruction to the roadway, signs or traffic lights.</li> </ul> <p>The activity includes all works associated with trimming of trees, grass and flowers planted under Activity 8161 and all ongoing maintenance, including fertilising and weeding. (Watering is included in Activity 8162).</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Planted trees shall have no defects.</li> <li>• Grass and flowers shall have a pleasing appearance.</li> <li>• Trees and grass shall not obstruct the roadway, signs or traffic lights.</li> <li>• Branches that affect sight distance or the open vista, and dead or diseased branches and limbs that will hinder the healthy normal growth of trees shall be removed.</li> <li>• Cuts shall be made flush at the collar of the supporting trunk or limb.</li> <li>• Trimming and cutting shall be carried out within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Trees, grass or flowers obscure regulatory signs	Without delay	Trees, grass or flowers obscure regulatory signs	Without delay	Trees, grass or flowers obscure regulatory signs	Without delay
Damage on trees, grass or flowers	1 w	Damage on trees, grass or flowers	2 w	Damage on trees, grass or flowers	4 w
Trees, grass or flowers impair sight distance	1 w	Trees, grass or flowers impair sight distance	2 w	Trees, grass or flowers impair sight distance	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LANDSCAPED AREAS MAINTENANCE	CODE:	8160
<b>Activity</b>	Special Features Maintenance	Code :	8164

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damage to stonework, concrete work, metalwork and timber work in landscaped areas.</p> <p><b>Main Causes:</b> Traffic damage, vandalism, lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Landscaped areas become unattractive.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance the appearance of landscaped areas.</li> <li>• Maintain traffic safety.</li> </ul> <p>The activity includes all work associated with maintenance and repair of stonework, concrete work, metalwork and timberwork in landscaped areas.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Special features in landscaped areas shall be in good repair and have no defects.</li> <li>• They shall not obstruct the roadway, signs or traffic lights.</li> <li>• Maintenance of special features shall be carried out within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Features obscure regulatory signs	Without delay	Features obscure regulatory signs	Without delay	Features obscure regulatory signs	Without delay
Damage on features	1 w	Damage on features	2 w	Damage on features	3 w
Features impair sight distance	1 w	Features impair sight distance	2 w	Features impair sight distance	3 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD RESERVE	CODE:	8100
<b>INTERVENTION</b>	LANDSCAPED AREAS MAINTENANCE	CODE:	8160
<b>Activity</b>	Landscaped Areas Cleaning	Code :	8165

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Untidy landscaped areas, dirt on facilities, litter on landscaped areas.</p> <p><b>Main Causes:</b> Inconsiderate road users, vandalism, accidental damage, litter collection and cleaning inadequate.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Road users discontent.</li> <li>• Hazard to people and animals.</li> <li>• Negative impact on environment.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance the appearance of landscaped areas in order to provide road users with adequate, functional and pleasing areas along the roads.</li> <li>• The objective of the Activity is to ensure that landscaped areas appear as clean and inviting safe places for the travelling public.</li> </ul> <p>The activity includes cleaning and servicing of all aspects of landscaped areas, necessary for the safety and convenience of the public.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Landscaped areas shall generally be clean and have a pleasing appearance, free of litter and debris.</li> <li>• Cleaning of landscaped areas shall be carried out within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Untidy appearance	2 w	Untidy appearance	4 w	Untidy appearance	6 w

## Maintenance Standards for Road and Bridge Works

### 8200 PAVED ROADWAY

#### 8201 Scope

Feature 8200 Paved Roadway covers routine maintenance interventions and activities to keep the paved roadway clean and smooth and free of localised ruttings, cracks, bleeding, depressions and potholes. It also covers maintenance of shoulders including removal of unwanted grass. The term paved roadway includes concrete paved roadways and block paved roadways. The feature further covers periodic maintenance activities, such as fogspray and bituminous overlays, as well as all types of resealing including Chip Seal, Slurry Seal, Sand Seal, Otta Seal and Cape Seal. All periodic maintenance activities shall generally be carried out in accordance with Standard Specifications for Road and Bridge Works (SSRBW) when required and as directed by the Engineer.

The feature "Paved Roadway" shall be defined as per the Botswana Road Design Manual (BRDM) and the Standard Specifications for Road and Bridge Works (SSRBW).

Feature 8200 Paved Roadway covers the following interventions and activities:

#### 8210 Bituminous Paved Roadway Routine Maintenance

- 8211 Paved Roadway Cleaning
- 8212 Rutting and Depression Repair
- 8213 Pothole Patching, Edge Damage and Surface Failure Repair
- 8214 Unpaved Shoulder Maintenance
- 8215 Crack Sealing
- 8216 Bleeding Repair
- 8217 Salt Blisters Repair
- 8219 Other Bituminous Paved Roadway Routine Maintenance

#### 8220 Bituminous Paved Roadway Periodic Maintenance

- 8221 Fogspray
- 8222 Resealing
- 8223 Bituminous Overlay
- 8224 Unpaved Shoulder Regravelling and Edge Drop Repair
- 8225 Unpaved Shoulder Reshaping
- 8229 Other Bituminous Paved Roadway Periodic Maintenance

#### 8230 Concrete Paved Roadway Maintenance

- 8231 Concrete Roadway Cleaning
- 8232 Concrete Roadway Crack Sealing
- 8233 Concrete Roadway Spalling Repair
- 8234 Concrete Roadway Pothole Repair
- 8235 Concrete Roadway Joint Stepping Repair
- 8236 Concrete Roadway Slab Repair
- 8239 Other Concrete Paved Roadway Maintenance

### **8240 Block Paved Roadway Maintenance**

- 8241 Block Paved Roadway Cleaning
- 8242 Block Paved Roadway Deformation Repair
- 8243 Paving Blocks Replacement
- 8244 Block Paved Roadway Grass Removal
- 8249 Other Block Paved Roadway Maintenance

### **8250 Paved Footpath and Cycle Path Maintenance**

- 8251 Paved Footpath and Cycle Path Cleaning
- 8252 Paved Footpath and Cycle Path General Surface Repair
- 8259 Other Paved Footpath and Cycle Path Maintenance

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8210

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8211 Paved Roadway Cleaning</li> <li>8212 Rutting and Depression Repair</li> <li>8213 Pothole Patching, Edge Damage and Surface Failure Repair</li> <li>8214 Unpaved Shoulder Maintenance</li> <li>8215 Crack Sealing</li> <li>8216 Bleeding Repair</li> <li>8217 Salt Blisters Repair</li> <li>8219 Other Bituminous Paved Roadway Routine Maintenance</li> </ul> <p>Activity 8219 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8211 to 8219.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8210 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
No potholes, edge breaks, wide cracks (> 3 mm) or other surface failures	3 d	No potholes, edge breaks, wide cracks (> 3 mm) or other surface failures	1 w	No potholes, edge breaks, wide cracks (> 3 mm) or other surface failures	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8210
<b>Activity</b>	Paved Roadway Cleaning	Code :	8211

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Loose sand, stones, soil, aggregates and debris on roadway or raised medians.</p> <p><b>Main Causes:</b> Loose sand allowed to accumulate, wind and storm water depositions of debris, dirty vehicle wheels, spillage from vehicles.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard.</li> <li>• Ponding of water on roadway.</li> <li>• Unwanted vegetation growth.</li> <li>• Roadway run-off impaired.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain traffic safety.</li> <li>• Maintain a pleasing appearance of the roadway.</li> <li>• Clean soil and other deposits to prevent ponding and vegetation growth that may weaken the pavement.</li> </ul> <p>The activity includes all works associated with removing sand, stones, soil, aggregates and other debris from roadway surfaces and raised medians.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The road surface must always be clean and free of sand, stones, soil, aggregates, debris, and other objects.</li> <li>• Cleaning of bituminous paved roadway shall be carried out within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Dirt and debris accumulation pose a danger to traffic safety	Without delay	Dirt and debris accumulation pose a danger to traffic safety	Without delay	Dirt and debris accumulation pose a danger to traffic safety	Without delay
Dirt and debris accumulation, but pose no danger to traffic safety	2 w	Dirt and debris accumulation, but pose no danger to traffic safety	3 w	Dirt and debris accumulation, but pose no danger to traffic safety	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8210
<b>Activity</b>	Rutting and Depression Repair	Code :	8212

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Rutting and/or depressions in roadway.</p> <p><b>Main Causes:</b> Inferior pavement material, lack of maintenance, lack of subgrade support, fatigue as a result of repeated deflections under heavy vehicles.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard due to problems of manoeuvring.</li> <li>• Ponding of water on roadway.</li> <li>• Severe rutting may lead to penetration of water into deeper layers of pavement reducing bearing capacity.</li> <li>• Standing water on the roadway, ponding, caused by depressions may also cause aquaplaning.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Arrest defects in order to maintain traffic safety.</li> <li>• Restore riding quality.</li> </ul> <p>The activity includes filling of ruts and depressions, repairing local defects due to loss of aggregates to maintain traffic safety.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Rutting shall not exceed the specified Threshold Level R mm, in more than 5 percent of any of the road sections defined in the contract.</li> <li>• Rut depth R is measured as space between a straight edge and lowest point of rut, using a straight edge of 2 m length placed perpendicularly across lane.</li> <li>• Less than N1 failures with a depression of more than 50 mm per 1 km road.</li> <li>• Less than N2 surface failures with a diameter greater than 100 mm per 1 km road.</li> <li>• Rutting and Depression Repair shall be carried out within the maximum response times for Threshold Levels and Defects given in the tables below:</li> </ul>					
<b>Threshold Levels – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
R = 25	1 w	R = 35	2 w	R = 45	3 w
N1 = 0	1 w	N1 = 3	2 w	N1 = 5	3 w
N2 = 0	1 w	N2 = 3	2 w	N2 = 5	3 w

## Maintenance Standards for Road and Bridge Works

Defect – Response Time					
Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
Depression with a vertical depth differential of 50 mm or more over a 2 m length	1 w	Depression with a vertical depth differential of 50 mm or more over a 2 m length	2 w	Depression with a vertical depth differential of 50 mm or more over a 2 m length	3 w
Water ponding on roadway caused by pavement surface depressions	1 w	Water ponding on roadway caused by pavement surface depressions	2 w	Water ponding on roadway caused by pavement surface depressions	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8210
<b>Activity</b>	Pothole Patching, Edge Damage and Surface Failure Repair	Code :	8213

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Potholes in roadway surface, pavement edge drops, pavement edge breaks and surface failures such as shoving, isolated severe crocodile cracking, ravelling and other surface defects caused by accidents, spillage etc.</p> <p><b>Main Causes:</b> Inferior pavement material, lack of maintenance, lack of subgrade support, traffic action, pavement ageing.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazards.</li> <li>• Water penetration into pavement layers which reduce bearing capacity and accelerates deterioration.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Arrest pavement structure and surface defects in order to maintain traffic safety.</li> <li>• Restore riding quality and to maintain a straight and consistent edge of the pavement.</li> </ul> <p>The activity includes repair of isolated potholes in the paved surface that is otherwise in a relatively sound condition, repair of broken pavement edges and repair of isolated surface failures. Work consists of the vertical cutting, excavation and disposal of existing pavement, excavation and disposal of unsuitable base and subbase material, and repair of asphalt pavement, base course and subbase, all in accordance with MSSRBW 8213.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The number of Large Potholes shall not be more than N1 per 1 km of road.</li> <li>• The number of Small Potholes shall not be more than N2 per 1 km of road.</li> <li>• "Large potholes" are defined as potholes with an area of 0.04 m<sup>2</sup> (i.e. 200 mm x 200 mm or 100 mm x 400 mm) or greater and a depth greater than 50 mm.</li> <li>• Pothole Patching, Edge Damage and Surface Failure Repair shall be carried out within the maximum response times given in the tables below:</li> </ul>					
<b>Threshold Levels – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
N1 = 0	Without delay	N1 = 0	Without delay	N1 = 0	Without delay
N2 = 0	Without delay	N2 = 2	2 d	N2 = 3	3 d
N2 = 0	1 w	N2 = 3	2 w	N2 = 5	3 w



## Maintenance Standards for Road and Bridge Works

Defect – Response Time					
Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
Surface failure being a traffic hazard in the opinion of the engineer	1 w	Surface failure being a traffic hazard in the opinion of the engineer	2 w	Surface failure being a traffic hazard in the opinion of the engineer	3 w
Surface failure not being being a traffic hazard.	2 w	Surface failure not being being a traffic hazard.	3 w	Surface failure not being being a traffic hazard.	4 w
Drop-off exceeding 50 mm	1 w	Drop-off exceeding 50 mm	2 w	Drop-off exceeding 50 mm	3 w
Difference in height between edge of pavement and shoulder (H) >15 mm.	1 w	Difference in height between edge of pavement and shoulder (H) >15 mm.	2 w	Difference in height between edge of pavement and shoulder (H) >15 mm.	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8210
<b>Activity</b>	Unpaved Shoulder Maintenance	Code :	8214

<b>Defects, Main Causes and Effects</b>	
<p><b>Defects:</b> Potholes in shoulders, washouts, drop-offs, inadequate bearing capacity, inadequate crossfall, windrows, unwanted vegetation.</p> <p><b>Main Causes:</b> Inferior shoulder material, shoulder material adjoining pavement edge displaced away from pavement edge through traffic action, shoulder material loosened and increased in bulk through vegetation growth, lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard.</li> <li>• Water penetration into deeper pavement layers which reduces bearing capacity and accelerates deterioration.</li> <li>• Ponding of water on shoulder.</li> </ul>	
<b>Purpose and Description</b>	
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Arrest defects in order to maintain traffic safety.</li> <li>• Maintain a smooth and safe shoulder.</li> <li>• Accommodate safe emergency stopping of vehicles.</li> <li>• Provide lateral support of base and surfacing.</li> <li>• Increase the effective use of traffic lanes by encouraging vehicle operations to drive close to the pavement edge.</li> </ul> <p>The activity includes removal of unwanted material and vegetation, and shaping the gravel shoulders to eliminate edge drops, potholes, erosion runnels and corrugations to provide a smooth running surface and to ensure that water can drain freely off the carriageway and shoulders.</p>	
<b>Service Quality Standard</b>	
<ul style="list-style-type: none"> <li>• Gravel shoulders shall be without severe defects.</li> <li>• Adequate bearing capacity shall be maintained at all times.</li> <li>• Water shall not be allowed to run along shoulders during periods of runoff.</li> <li>• Correct crossfall between 3.0 – 4.0 % shall be maintained on all shoulders.</li> <li>• Shoulder drop-off shall not exceed 50 mm.</li> <li>• Outside of shoulders shall have a neat, straight edge.</li> <li>• Windrow of loose material (gravel) at pavement edge, outside shoulder edge or under guardrail shall be eliminated.</li> <li>• Shoulder washouts caused by heavy rainfall shall be repaired.</li> <li>• No persistently soft or wet areas of shoulders shall be allowed.</li> <li>• Defects shall be treated within the response times given in the table below. It shall be performed as required or directed prior to the wet season to ensure that water can drain freely off the carriageway. If the material on the shoulders is insufficient to provide the correct shape and level, fresh gravel must be added.</li> </ul>	

## Maintenance Standards for Road and Bridge Works

Defect – Response Time					
Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
Windrows/berms at the outside edge of the shoulder	1 w	Windrows/berms at the outside edge of the shoulder	2 w	Windrows/berms at the outside edge of the shoulder	3 w
Washouts >1.0 m <sup>2</sup> and at least 150 mm deep	1 w	Washouts >1.0 m <sup>2</sup> and at least 150 mm deep	2 w	Washouts >1.0 m <sup>2</sup> and at least 150 mm deep	3 w
Drop-off exceeding 50 mm	1 w	Drop-off exceeding 50 mm	2 w	Drop-off exceeding 50 mm	3 w
Inadequate bearing capacity	1 w	Inadequate bearing capacity	2 w	Inadequate bearing capacity	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8210
<b>Activity</b>	Crack Sealing	Code :	8215

### Defects, Main Causes and Effects

**Defects:** Cracks in paved surface.

**Main Causes:** Loss of fines through pumping, drying out of the asphalt or binder, poor quality of mixture or workmanship, repeated deflections in base and subbase layers caused by heavy vehicle loads, weakness at construction joints.

**Effects:**

- Poor riding quality.
- Traffic hazard.
- Water penetration into pavement layers which reduce bearing capacity and accelerates deterioration.

### Purpose and Description

The purpose of this activity is to:

- Crack Sealing is performed where longitudinal and/or transverse cracks or block cracks have developed in order to fill the cracks as completely as possible with bituminous binder to prevent water to enter the pavement layers.
- Enhance traffic safety and riding quality.
- Prevent weakening the roadway structure due to moisture penetrating to the base and subgrade .
- Prevent material spalling from the edges of the cracks.

The activity includes all works associated with sealing of transverse and longitudinal cracks of a paved road.

### Service Quality Standard

- There shall be no visible cracks in the paved surface.
- For any 50 m section of the road, the cracked area shall not be more than (N) percent of the pavement surface. Crack widths to be measured with small transparent ruler.
- For isolated cracks, the "cracked area" includes 0,25 m on each side of the crack, multiplied by the length of the crack plus 0,25 m at each end.
- For multiple cracks and cracks crossing each other, the "cracked area" is equivalent to a square area, parallel to the lanes, which fully encloses the cracks, and where the closest crack is at least 0.25 m away from the sides of the square.
- Crack Sealing shall be carried out in accordance with the threshold levels and response times given in the table below:

### Threshold Levels – Response Time

Service Level A		Service Level B		Service Level C	
Threshold Level	Response Time	Threshold Level	Response Time	Threshold Level	Response Time
N = 10	3 d	N = 10	1 w	N = 10	3 d

### Defect – Response Time

Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
Visible cracks	1 w	Visible cracks	3 w	Visible cracks	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8210
<b>Activity</b>	Bleeding Repair	Code :	8216

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Bleeding; i.e. excess bitumen binder, on paved surface.</p> <p><b>Main Causes:</b> Overapplication of bitumen binder and/or loss of aggregate, inferior binder quality, punching of surface chips into the base or underlying seal.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>Traffic hazard due to reduced friction on paved surface.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>Repair local defects due to bleeding to maintain traffic safety by elimination of slipperiness.</li> </ul> <p>The activity includes treatment of excess binder by spreading of appropriate aggregate, rolling it into the surface and leaving it to be further worked into the excess bitumen binder by traffic, or as otherwise directed by the Engineer. The treatment may have to be repeated and the aggregate be broomed back onto the surfaces to be covered until there are no signs of further bleeding.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>There shall be no bleeding areas on the paved roadway.</li> <li>The treated areas shall be level with the surrounding surface and show no sign of further bleeding.</li> <li>Defects due to bleeding shall be repaired as directed within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Bleeding being a traffic hazard in the opinion of the engineer	Without delay	Bleeding being a traffic hazard in the opinion of the engineer	Without delay	Bleeding being a traffic hazard in the opinion of the engineer	Without delay
Other bleeding	3 d	Other bleeding	1 w	Other bleeding	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8210
<b>Activity</b>	Salt Blisters Repair	Code :	8217

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Blisters on paved surface of roadway; adhesion of paved surface to the road base inadequate.</p> <p><b>Main Causes:</b> Soluble salt present in pavement materials, compaction water, subgrade or groundwater.</p> <p><b>Effects:</b></p> <p>Damaged surface layer.</p> <ul style="list-style-type: none"> <li>• Traffic hazard.</li> <li>• Initiate surface ravelling.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Repair local paved surface defects due to salt blisters.</li> </ul> <p>The activity includes removal of blisters and repair of paved surface of roadway.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• There shall be no salt blisters on the paved roadway or paved pedestrian footpaths or cycle paths.</li> <li>• Defects due to salt blisters shall be repaired as directed within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Salt blisters being a traffic hazard in the opinion of the engineer	Without delay	Salt blisters being a traffic hazard in the opinion of the engineer	Without delay	Salt blisters being a traffic hazard in the opinion of the engineer	Without delay
Isolated blisters occur on roadway	2 w	Isolated blisters occur on roadway	3 w	Isolated blisters occur on roadway	4 w
Isolated blisters occur on footpath and cycle path	4 w	Isolated blisters occur on footpath and cycle path	5 w	Isolated blisters occur on footpath and cycle path	6 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY PERIODIC MAINTENANCE	CODE:	8220

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8221 Fogspray</li> <li>8222 Resealing (includes Chip Seal, Slurry Seal, Sand Seal, Otta Seal, Cape Seal or others as directed)</li> <li>8223 Bituminous Overlay</li> <li>8224 Unpaved Shoulder Regravelling and Edge Drop Repair</li> <li>8225 Unpaved Shoulder Reshaping</li> <li>8229 Other Bituminous Paved Roadway Periodic Maintenance</li> </ul> <p>Activity 8229 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8221 to 8229.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8220 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Deteriorated surface, surface lean and “hungry” or pavement defects in the opinion of the Engineer	4 w	Deteriorated surface, surface lean and “hungry” or pavement defects in the opinion of the Engineer	4 w	Deteriorated surface, surface lean and “hungry” or pavement defects in the opinion of the Engineer	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE: 8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY PERIODIC MAINTENANCE	CODE: 8220
<b>Activity</b>	Fogspray	Code : 8221

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Lean and “hungry” chip seal surface texture, close-spaced fine cracking.</p> <p><b>Main Causes:</b> Loss of binder flexibility, minor loss of aggregate, binder dried out or deteriorated, inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Ingress of water.</li> <li>• Pavement structure deterioration.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Slow down further deterioration of the surface and restore traffic safety and trafficability.</li> </ul> <p>The activity includes supplying and applying diluted emulsion onto a lean and “hungry” surface of paved roadways to seal small cracks and surface voids and to slow down oxidation, and prevent ravelling. Where road marking, including reflective studs, is covered by fogspray, the activity will also include application of temporary road marking (spotting).</p> <p>Permanent road marking shall be done under Activity 8731 Road Marking Repainting and Activity 8732 Reflective Stud Maintenance.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Fogspray shall be carried out within the response times given in the table below, or as directed by the Engineer, ascertained by visual condition survey. For Fogspray the response time shall be until fogspray operations start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Lean and “hungry” surface, in the opinion of the Engineer	4 w	Lean and “hungry” surface, in the opinion of the Engineer	4 w	Lean and “hungry” surface, in the opinion of the Engineer	6 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY PERIODIC MAINTENANCE	CODE:	8220
<b>Activity</b>	Resealing	Code :	8222

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Lean, uneven and “hungry” surface texture.</p> <p><b>Main Causes:</b> Brittle surface, binder oxidation, loss of aggregate, inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced riding comfort.</li> <li>• Traffic hazard.</li> <li>• Ingress of water.</li> <li>• Pavement structure deterioration.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Slow down further deterioration of the surface and restore traffic safety and driving conditions.</li> </ul> <p>The activity includes supplying and applying an approved seal, as directed by the Engineer, to the surface of existing bituminous paved roadways. It includes, but is not limited to Chip Seal, Slurry Seal, Sand Seal, Otta Seal or, Cape Seal, and the use of “SAMI” if required. Where a surface seal covers existing road markings and/or reflective studs, the activity will also include the application of temporary road markings (spotting).</p> <p>Permanent road marking shall be done under Activity 8731 Road Marking Repainting and Activity 8732 Reflective Stud Maintenance.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Resealing shall be carried out within the response times given in the table below, or as directed by the Engineer, ascertained by relevant condition survey. For Resealing the response time shall be until resealing operations start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Lean, uneven and “hungry” surface texture in the opinion of the Engineer	4 w	Lean, uneven and “hungry” surface texture in the opinion of the Engineer	4 w	Lean, uneven and “hungry” surface texture in the opinion of the Engineer	6 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY PERIODIC MAINTENANCE	CODE:	8220
<b>Activity</b>	Bituminous Overlay	Code :	8223

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Deteriorated surface and pavement defects.</p> <p><b>Main Causes:</b> Worn out surface, loss of aggregate, inadequate pavement strength, inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Pavement structure deterioration.</li> <li>• Reduced riding comfort.</li> <li>• Traffic hazard.</li> <li>• Ingress of water.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Slow down further deterioration of the surface and/or the pavement structure to restore traffic safety and trafficability.</li> </ul> <p>The activity includes supplying and applying a bituminous overlay in accordance with SSRBW SERIES 4000: ASPHALT PAVING AND BITUMINOUS SURFACING. Where an overlay covers existing road markings, the activity will also include the application of temporary road markings (spotting).</p> <p>Permanent road marking shall be done under Activity 8731 Road Marking Repainting and Activity 8732 Reflective Stud Maintenance.</p>					
<b>Service Quality Standard</b>					
Bituminous Overlay shall be carried out within the response times given in the table below, or as directed by the Engineer ascertained by relevant condition survey.					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Deteriorated surface and pavement defects	4 w	Deteriorated surface and pavement defects	4 w	Deteriorated surface and pavement defects	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY PERIODIC MAINTENANCE	CODE:	8220
<b>Activity</b>	Unpaved Shoulder Regravelling and Edge Drop Repair	Code :	8224

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Accumulation of shoulder defects, such as washouts, inadequate crossfall, ruts and pavement edge drops.</p> <p><b>Main Causes:</b> Loss of shoulder material, inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced water run-off.</li> <li>• Lack of lateral support may lead to roadway edge breaks.</li> <li>• Traffic hazard; reduced area for traffic to pull off the roadway.</li> <li>• Ingress of water.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Restore adequate functioning of the shoulders.</li> <li>• Reinstall shoulder in order to restore a smooth transition between the paved carriageway and shoulder to ensure traffic safety.</li> </ul> <p>The activity includes supplying and applying approved shoulder material to unpaved shoulders to correct shoulder crossfall, drop-off and/or reduced shoulder width.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Unpaved shoulders shall not have drop-offs exceeding T mm for a length of 100 m.</li> <li>• Unpaved shoulders shall be repaired within the response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
T = 75	3 w	T = 75	4 w	T = 75	5 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BITUMINOUS PAVED ROADWAY PERIODIC MAINTENANCE	CODE:	8220
<b>Activity</b>	Unpaved Shoulder Reshaping	Code :	8225

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Accumulation of shoulder defects, such as runnels, inadequate crossfall, ruts and pavement edge drop.</p> <p><b>Main Causes:</b> Loss of shoulder material, inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced water run-off.</li> <li>• Lack of lateral support may lead to roadway edge breaks.</li> <li>• Traffic hazard; reduced area for traffic to pull off the roadway.</li> <li>• Ingress of water.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Restore the proper functioning of unpaved shoulders.</li> <li>• Reinstall shoulder surface to regain correct crossfall, to restore a smooth surface and to maintain a smooth transition between pavement and shoulder to ensure traffic safety.</li> </ul> <p>The activity includes all works to correct shoulder crossfall, drop-off and/or reduced shoulder width, or other shoulder defects.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Unpaved shoulders shall not have transverse runnels more than 150 mm deep.</li> <li>• Unpaved shoulders shall not have drop-offs exceeding T mm for a length of 100 m.</li> <li>• Correct crossfall (between 3.0 - 4.0 %) shall be maintained on the shoulder.</li> <li>• Unpaved shoulders shall be repaired within the response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
T = 50	2 w	T = 50	3 w	T = 50	4 w

<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Runnels deeper than 150 mm for a length of 50 m.	2 w	Runnels deeper than 150 mm for a length of 50 m.	3 w	Runnels deeper than 150 mm for a length of 50 m.	4 w
Crossfall < 3 %, or > 4 %	2 w	Crossfall < 3 %, or > 4 %	3 w	Crossfall < 3 %, or > 4 %	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	CONCRETE PAVED ROADWAY MAINTENANCE	CODE:	8230

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8231 Concrete Roadway Cleaning</li> <li>8232 Concrete Roadway Crack Sealing</li> <li>8233 Concrete Roadway Spalling Repair</li> <li>8234 Concrete Roadway Pothole Repair</li> <li>8235 Concrete Roadway Joint Stepping Repair</li> <li>8236 Concrete Roadway Slab Repair</li> <li>8239 Other Concrete Paved Roadway Maintenance</li> </ul> <p>Activity 8239 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8231 to 8239.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8230 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
The cracked area shall not be more than 5 % of the pavement surface for any 50 m road section	As directed by the Engineer	The cracked area shall not be more than 10 % of the pavement surface for any 50 m road section	As directed by the Engineer	The cracked area shall not be more than 15 % of the pavement surface for any 50 m road section	As directed by the Engineer
No potholes	As directed by the Engineer	< 5 potholes per km	As directed by the Engineer	< 5 potholes per km	As directed by the Engineer

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	CONCRETE PAVED ROADWAY MAINTENANCE	CODE:	8230
<b>Activity</b>	Concrete Roadway Cleaning	Code :	8231

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Loose sand, stones, aggregates and debris on roadway or raised medians.</p> <p><b>Main Causes:</b> Loose sand and dirt allowed to accumulate, severe weather conditions.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard.</li> <li>• Ponding of water on roadway.</li> <li>• Roadway run-off impaired.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain traffic safety.</li> <li>• Maintain a pleasing appearance of the roadway.</li> <li>• Prevent vegetation growth.</li> </ul> <p>The activity includes all works associated with cleaning of concrete roadways.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The road surface must always be clean and free of soil, debris, litter and other objects.</li> <li>• Concrete Roadway Cleaning shall be carried out within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Dirt and debris accumulation pose a danger to traffic safety	Without delay	Dirt and debris accumulation pose a danger to traffic safety	Without delay	Dirt and debris accumulation pose a danger to traffic safety	Without delay
Dirt and debris accumulation, but pose no danger to traffic safety	2 w	Dirt and debris accumulation, but pose no danger to traffic safety	3 w	Dirt and debris accumulation, but pose no danger to traffic safety	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	CONCRETE PAVED ROADWAY MAINTENANCE	CODE:	8230
<b>Activity</b>	Concrete Roadway Crack Sealing	Code :	8232

Defects, Main Causes and Effects					
<p><b>Defects:</b> Cracks in paved concrete surface.</p> <p><b>Main Causes:</b> Heavy wheel loads, poor quality of mixture or workmanship, repeated deflections caused by heavy vehicle loads, weakness at construction joints and subgrade movements.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Poor riding quality.</li> <li>• Traffic hazard.</li> <li>• Water penetration into underlying pavement layers which reduces bearing capacity and accelerates deterioration.</li> <li>• Ponding of water on roadway.</li> </ul>					
Purpose and Description					
<p>Crack sealing is performed where single or multiple cracks have developed. The objective is to fill the cracks as completely as possible with bituminous binder or other approved sealant to prevent water to enter the pavement layers. The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Improve traffic safety and riding quality.</li> <li>• Prevent moisture from penetrating the underlying layers thereby weakening the roadway structure.</li> <li>• Prevent material spalling from the edges of the cracks.</li> </ul> <p>The activity includes all works associated with repair of isolated or multiple transverse and longitudinal cracking on the surface of a concrete paved road by sealing the cracks with approved sealant.</p>					
Service Quality Standard					
<ul style="list-style-type: none"> <li>• There shall not be cracks more than 3 mm wide.</li> <li>• For any 50 m section of the road, the cracked area cannot be more than (N) percent of the pavement surface. Crack widths shall be measured with small transparent ruler.</li> <li>• For <b>isolated cracks</b>, the “cracked area” includes 0,25 m on each side of the crack, multiplied by the length of the crack plus 0,25 m at each end.</li> <li>• For <b>multiple cracks</b> and cracks crossing each other, the “cracked area” is equivalent to a square area, parallel to the lanes, which fully encloses the cracks, and where the closest crack is at least 0.25 m away from the sides of the square.</li> <li>• Concrete Roadway Crack Sealing shall be carried out in accordance with the threshold levels and response times given in the table below:</li> </ul>					
Threshold Level – Response Time					
Service Level A		Service Level B		Service Level C	
Threshold Level	Response Time	Threshold Level	Response Time	Threshold Level	Response Time
Cracks > 3 mm	1 w	Cracks > 3 mm	2 w	Cracks > 3 mm	3 w
N = 5	3 d	N = 10	1 w	N = 15	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	CONCRETE PAVED ROADWAY MAINTENANCE	CODE:	8230
<b>Activity</b>	Concrete Roadway Spalling Repair	Code :	8233

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Spalling occurs on concrete paved surface.</p> <p><b>Main Causes:</b> Heavy wheel loads, poor quality of mixture or workmanship, repeated deflections in base and subbase layers caused by heavy vehicle loads, weakness at construction joints and subgrade movements.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Poor riding quality.</li> <li>• Traffic hazard.</li> <li>• Water penetration into underlying layers which reduces bearing capacity and accelerates deterioration.</li> <li>• Ponding of water on roadway.</li> </ul>					
<b>Purpose and Description</b>					
<p>Concrete roadway spalling repair is performed where the concrete surface has broken up into smaller fragments. The objective is to restore the riding surface by remedying or reinstating the surface. The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Improve traffic safety and riding quality.</li> <li>• Prevent moisture from penetrating the underlying layers thereby weakening the roadway structure.</li> <li>• Prevent further material spalling.</li> </ul> <p>The activity includes all works associated with repair of spalling concrete surface by casting concrete over the spalled area in order to reinstate the original concrete thickness and restore the structural integrity of the concrete surface.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Concrete Roadway Spalling Repair shall be carried out in accordance with the threshold levels and response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Occurrence of spalling	2 w	Occurrence of spalling	3 w	Occurrence of spalling	4 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	CONCRETE PAVED ROADWAY MAINTENANCE	CODE:	8230
<b>Activity</b>	Concrete Roadway Pothole Repair	Code :	8234

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Depressions/holes in concrete surface.</p> <p><b>Main Causes:</b> Heavy wheel loads, loss of fines through pumping, poor quality of concrete or workmanship, repeated deflections in subbase layers caused by heavy vehicle loads, weakness at construction joints and subgrade movement.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Poor riding quality.</li> <li>• Traffic hazard.</li> <li>• Water penetration into underlying pavement layers which reduces bearing capacity and accelerates deterioration.</li> <li>• Ponding of water on roadway.</li> </ul>					
<b>Purpose and Description</b>					
<p>Pothole patching is performed where potholes have developed to restore riding conditions and to prevent further deterioration of the underlying layers. The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Improve traffic safety and riding quality.</li> <li>• Prevent moisture from penetrating underlying layers thereby weakening the roadway structure.</li> <li>• Prevent material spalling.</li> </ul> <p>The activity includes all works associated with repair of potholes in accordance with MSSRBW 8234.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The number of large potholes per km shall not exceed the threshold value, N, given in the table below.</li> <li>• Large potholes" are defined as potholes with an area of 0.04 m<sup>2</sup> (i.e. 200 mm x 200 mm or 100 mm x 400 mm) or greater and a depth greater than 50 mm.</li> <li>• Potholes shall be repaired in accordance with the threshold levels and response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
N = 0	3 d	N = 10	1 w	N = 10	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	CONCRETE PAVED ROADWAY MAINTENANCE	CODE:	8230
<b>Activity</b>	Concrete Roadway Joint Stepping Repair	Code :	8235

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Joints stepping or separation.</p> <p><b>Main Causes:</b> Heavy wheel loads, poor quality of workmanship, repeated deflections in underlying layers caused by poor soil conditions or heavy vehicle loads, weakness at construction joints and subgrade movement.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Poor riding quality due to differential settlements of pavement slabs.</li> <li>• Traffic hazard.</li> <li>• Pumping of underlying materials through the joint and ultimate slab failure.</li> <li>• Surface runoff allowed to penetrate into underlying layers which reduce bearing capacity and accelerates deterioration.</li> <li>• Ponding of water on roadway.</li> <li>• Provides space for growth of vegetation.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Restore the riding quality by remedying the surface.</li> <li>• Improve traffic safety.</li> <li>• Prevent moisture from penetrating the underlying layers thereby weakening the roadway structure.</li> </ul> <p>The activity includes all works associated with repair of separated or stepped joint in concrete pavements.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• There shall not be vertical steps of more than N mm between adjacent concrete slabs</li> <li>• Concrete Roadway Joint Stepping Repair shall be performed in accordance with the threshold levels and response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
N = 10	2 w	N = 15	4 w	N = 15	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	CONCRETE PAVED ROADWAY MAINTENANCE	CODE:	8230
<b>Activity</b>	Concrete Roadway Slab Repair	Code :	8236

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Irregular riding surface due to sunken or broken concrete slab.</p> <p><b>Main Causes:</b> Heavy wheel loads, poor quality of workmanship, failure or movement of the road subbase layer caused by poor soil conditions or heavy vehicle loads or subgrade movement.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Poor riding quality.</li> <li>• Traffic hazard.</li> <li>• Pumping of underlying materials through the joint and ultimate slab failure.</li> <li>• Surface run-off allowed to penetrate into underlying layers which reduces bearing capacity and accelerates deterioration.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Restore the riding surface by rehabilitation of the pavement structure.</li> <li>• Improve traffic safety and riding quality.</li> <li>• Prevent moisture from penetrating the underlying layers thereby weakening the roadway structure.</li> </ul> <p>The activity includes all works associated with major repairs of concrete paved roadways, such as re-establishing support layers under concrete slabs without removing the slabs, raising the slab by replacing lost or sunken supporting material.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The concrete paved roadway shall provide a smooth running surface.</li> <li>• Concrete paved roadways shall be repaired in accordance with the response times given in the table below, or as directed by the Engineer:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Slab failure	2 w	Slab failure	3 w	Slab failure	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BLOCK PAVED ROADWAY MAINTENANCE	CODE:	8240

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8241 Block Paved Roadway Cleaning</li> <li>8242 Block Paved Roadway Deformation Repair</li> <li>8243 Paving Blocks Replacement</li> <li>8244 Block Paved Roadway Grass Removal</li> <li>8249 Other Block Paved Roadway Maintenance</li> </ul> <p>Activity 8249 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8241 to 8249.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8240 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Visible deformations	1 w	Visible deformations	2 w	Visible deformations	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BLOCK PAVED ROADWAY MAINTENANCE	CODE:	8240
<b>Activity</b>	Block Paved Roadway Cleaning	Code :	8241

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Loose sand, stones, aggregates and debris on roadway or raised medians.</p> <p><b>Main Causes:</b> Loose sand allowed to accumulate, severe weather conditions.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard.</li> <li>• Ponding of water on roadway.</li> <li>• Roadway run-off impaired.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain traffic safety.</li> <li>• Maintain a pleasing appearance of the roadway.</li> <li>• Prevent vegetation growth.</li> </ul> <p>The activity includes all works associated with removing soil and other debris from pavement surfaces and raised medians.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The road surface must always be clean and free of soil, debris, litter and other objects.</li> <li>• Block Paved Roadway Cleaning shall be carried out within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Dirt and debris accumulation pose a danger to traffic safety	Without delay	Dirt and debris accumulation pose a danger to traffic safety	Without delay	Dirt and debris accumulation pose a danger to traffic safety	Without delay
Dirt and debris accumulation, but pose no danger to traffic safety	2 w	Dirt and debris accumulation, but pose no danger to traffic safety	3 w	Dirt and debris accumulation, but pose no danger to traffic safety	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BLOCK PAVED ROADWAY MAINTENANCE	CODE:	8240
<b>Activity</b>	Block Paved Roadway Deformation Repair	Code :	8242

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Deformations in block paved roadway surface.</p> <p><b>Main Causes:</b> Heavy wheel loads, loss of fines through pumping, poor quality of material in underlying layer, repeated deflections in underlying layers caused by heavy vehicle loads, weakness at joints.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Poor riding quality.</li> <li>• Traffic hazard.</li> <li>• Water penetration into deeper pavement layers which reduces bearing capacity and accelerates deterioration.</li> <li>• Ponding of water on roadway.</li> </ul>					
<b>Purpose and Description</b>					
<p>Deformation repair is performed where the block paved surface has developed visible deformations. The objective is to restore riding quality and appearance of the surface. The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance traffic safety and riding quality.</li> <li>• Prevent ponding of water.</li> </ul> <p>The activity includes all works associated with deformation repairs to reinstate surface to level.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• There shall be no visible deformations of the surface.</li> <li>• Deformation Repair shall be carried out in accordance with the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Visible deformations	1 w	Visible deformations	2 w	Visible deformations	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BLOCK PAVED ROADWAY MAINTENANCE	CODE:	8240
<b>Activity</b>	Paving Blocks Replacement	Code :	8243

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Missing or broken paving blocks.</p> <p><b>Main Causes:</b> Heavy wheel loads, repeated deflections in underlying layers caused by heavy vehicle loads, weakness at construction joints, poor workmanship.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Poor riding quality.</li> <li>• Traffic hazard.</li> <li>• Water penetration into deeper pavement layers which reduces bearing capacity and accelerates deterioration.</li> </ul>					
<b>Purpose and Description</b>					
<p>Broken or missing paving block shall be replaced with the same type of block. The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance traffic safety and riding quality.</li> <li>• Prevent moisture from penetrating the underlying layers thereby weakening the roadway structure.</li> </ul> <p>The activity includes provision of paving blocks and all works associated with replacement of missing or damaged blocks.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• There shall be no broken or missing paving blocks.</li> <li>• Paving Block Replacement shall be carried out in accordance with the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Missing or damaged paving blocks	1 w	Missing or damaged paving blocks	2 w	Missing or damaged paving blocks	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	BLOCK PAVED ROADWAY MAINTENANCE	CODE:	8240
<b>Activity</b>	Block Paved Roadway Grass Removal	Code :	8244

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Grass growing between paving blocks..</p> <p><b>Main Causes:</b> Grass allowed to grow unchecked, lack of cleaning.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to block paved roadway</li> <li>• Traffic hazard.</li> <li>• Run-off impaired and ponding of water on roadway.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Improve the general appearance of the roadway.</li> <li>• Maintain traffic safety.</li> <li>• Avoid damage to pavement structure.</li> </ul> <p>The activity includes the removal of grass and other harmful weed on the roadway to prevent the grass or weed to establish and roots penetrating the surface layers.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Grass shall not be allowed to grow on the roadway. In areas where grass or other harmful weeds is growing, it shall be removed regularly or as directed by the Engineer to prevent it from spreading. Alternatively the grass or harmful weed may be kept in check by use of herbicides at the approval of the Engineer. Burning of grass shall not be allowed.</li> <li>• Grass shall be removed from the block paved roadway in accordance with the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Grass growing on block paved roadway	2 w	Grass growing on block paved roadway	3 w	Grass growing on block paved roadway	4 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	PAVED FOOTPATH AND CYCLE PATH MAINTENANCE	CODE:	8250

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8251 Paved Footpath and Cycle Path Cleaning</li> <li>8252 Paved Footpath and Cycle Path General Surface Repair</li> <li>8259 Other Paved Footpath and Cycle Path Maintenance</li> </ul> <p>Activity 8259 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8251 to 8259.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8250 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Dirt and debris accumulation	1 w	Dirt and debris accumulation	2 w	Dirt and debris accumulation	3 w
Bumps or depressions with a vertical depth differential $\geq$ 50 mm over a 2 m length	1 w	Bumps or depressions with a vertical depth differential $\geq$ 50 mm over a 2 m length	2 w	Bumps or depressions with a vertical depth differential $\geq$ 50 mm over a 2 m length	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	PAVED FOOTPATH AND CYCLE PATH MAINTENANCE	CODE:	8250
<b>Activity</b>	Paved Footpath and Cycle Path Cleaning	Code :	8251

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Loose sand, stones, aggregates and debris on paved footpaths or cycle paths.</p> <p><b>Main Causes:</b> Loose sand allowed to accumulate, wind and storm water depositions of debris, spillage from vehicles.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard to public.</li> <li>• Ponding of water on paths.</li> <li>• Unwanted vegetation growth.</li> <li>• Nuisance for users.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain a pleasing appearance of the paved footpaths and cycle paths.</li> <li>• Clean soil and other deposits to prevent ponding and vegetation growth.</li> <li>• Maintain traffic safety for public users.</li> </ul> <p>The activity includes all works associated with removing soil and other debris from footpath and cycle path surfaces.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The paved footpath and cycle path surface must always be clean and free of soil, debris, litter and other objects.</li> <li>• Paved Footpath and Cycle Paths Cleaning shall be carried out within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Dirt and debris accumulation	1 w	Dirt and debris accumulation	2 w	Dirt and debris accumulation	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	PAVED ROADWAY	CODE:	8200
<b>INTERVENTION</b>	PAVED FOOTPATH AND CYCLE PATH MAINTENANCE	CODE:	8250
<b>Activity</b>	Paved Footpath and Cycle Path General Surface Repair	Code :	8252

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Rutting and/ or depressions and cracking/ravelling in paved footpaths and cycle paths.</p> <p><b>Main Causes:</b> Inferior material, lack of maintenance, lack of subgrade support.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Ponding of water on paths.</li> <li>• Nuisance to users.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Arrest defects in order to maintain a pleasing appearance and comfort to users.</li> </ul> <p>The activity includes filling of ruts and depressions, repairing local defects due to loss of aggregates (stripping/ravelling, fretting) to maintain traffic safety.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Bumps or depressions for bituminous surfaces shall not exceed 50 mm measured as space between a 2 m straight edge placed perpendicularly across path and shall be free of ponding water. For concrete slabs with abrupt edges, the vertical deviation shall not be more than 20 mm.</li> <li>• The number of potholes per 100 m shall not be more than specified in the table below.</li> <li>• Paved Footpath and Cycle Path General Surface Repair shall be done within the maximum response times for Defects given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Bumps or depressions with a vertical depth differential of 50 mm or more over a 2 m length on bituminous surfaces	1 w	Bumps or depressions with a vertical depth differential of 50 mm or more over a 2 m length on bituminous surfaces	2 w	Bumps or depressions with a vertical depth differential of 50 mm or more over a 2 m length on bituminous surfaces	3 w
Abrupt edges for concrete slabs not exceeding 20 mm	1 w	Abrupt edges for concrete slabs not exceeding 20 mm	2 w	Abrupt edges for concrete slabs not exceeding 20 mm	3 w
Water ponding on paths caused by pavement surface depressions	1 w	Water ponding on paths caused by pavement surface depressions	2 w	Water ponding on paths caused by pavement surface depressions	3 w
More than 2 pot-holes per 100 m	1 w	More than 5 pot-holes per 100 m	2 w	More than 5 pot-holes per 100 m	2 w

## Maintenance Standards for Road and Bridge Works

### 8300 UNPAVED ROADWAY

#### 8301 Scope

Feature 8300 Unpaved Roadway covers routine maintenance activities to keep the unpaved roadway free of potholes, corrugations and localised erosion runnels to provide a smooth running surface. It also covers periodic maintenance activities in the form of grading, reshaping, regravelling or sand cushioning. All periodic maintenance activities shall generally be carried out in accordance with Standard Specifications for Road and Bridge Works when required and as directed by the Engineer.

The feature "Unpaved Roadway" shall be defined as per the Botswana Road Design Manual (BRDM) and the Standard Specifications for Road and Bridge Works (SSRBW).

Feature 8300 Unpaved Roadway covers the following interventions and activities:

#### 8310 Unpaved Roadway Routine Maintenance

- 8311 Dragging
- 8312 Maintenance of Sand Cushioning Layer
- 8313 Dry Grading
- 8314 Unpaved Roadway Pothole Patching
- 8315 Unpaved Roadway Erosion Runnels Repair
- 8316 Dust Prevention
- 8319 Other Unpaved Roadway Routine Maintenance

#### 8320 Unpaved Roadway Periodic Maintenance

- 8321 Wet Grading
- 8322 Reshaping
- 8323 Regravelling
- 8324 Sand Cushioning
- 8329 Other Unpaved Roadway Periodic Maintenance

#### 8330 Unpaved Footpath and Cycle Path Maintenance

- 8331 Unpaved Footpath and Cycle Path Cleaning
- 8332 Unpaved Footpath and Cycle Path General Surface Repair
- 8339 Other Unpaved Footpath and Cycle Path Maintenance

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8310

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8311 Dragging</li> <li>8312 Maintenance of Sand Cushioning Layer</li> <li>8313 Dry Grading</li> <li>8314 Unpaved Roadway Pothole Patching</li> <li>8315 Unpaved Roadway Erosion Runnels Repair</li> <li>8316 Dust Prevention</li> <li>8319 Other Unpaved Roadway Routine Maintenance</li> </ul> <p>Activity 8319 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8311 to 8319.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8310 shall be as shown in the table below:</p>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
Average traffic speed < 60 km/h	1 w	Average traffic speed < 50 km/h	2 w	Average traffic speed < 40 km/h	3 w
Road corrugation amplitude ≥ 40 mm	1 w	Road corrugation amplitude ≥ 40 mm	2 w	Bumps or road corrugation amplitude ≥ 40 mm	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8310
<b>Activity</b>	Dragging	Code :	8311

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Corrugations in the unpaved road surface or dislodged sand for sand cushioning layer.</p> <p><b>Main Causes:</b> Inferior surface material, relatively high volume of traffic and inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced driving speed.</li> <li>• Reduced driving comfort.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Repair defects in the unpaved road surface.</li> <li>• Improve the running surface.</li> <li>• Reduce the required amount of grading.</li> </ul> <p>The activity includes dragging of the unpaved roadway surface by a tractor or by specially made drags such as tyre or steel beam drags ("spoor machine" for sand tracks only), or sledge drags made from old tyres in order to remove minor irregularities from the road surface, and redistribute loose surface material.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The unpaved surface shall provide a smooth running surface without severe defects. The sand track shall be in such condition that it is passable and comfortable to travel without any sharp lateral displacements or deep wheel furrows and to the satisfaction of the Engineer.</li> <li>• Dragging on earth and gravel roads shall not be done when corrugations exceed 40 mm, for which other methods such as grading will apply.</li> <li>• Dragging shall be carried out within the response times given in the tables below:</li> </ul>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
Corrugations > 20 mm	1 w	Corrugations > 20 mm	2 w	Corrugations > 20 mm	3 w

<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Sand tracks difficult to travel in the opinion of the Engineer	3 d	Sand tracks difficult to travel in the opinion of the Engineer	1 w	Sand tracks difficult to travel in the opinion of the Engineer	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8310
<b>Activity</b>	Maintenance of Sand Cushioning Layer	Code :	8312

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Exposed gravel wearing course due to displacement of sand cushioning layer.</p> <p><b>Main Causes:</b> Dislodged sand cushioning due to traffic action and weather effects.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Increased abrasion of the gravel layer.</li> <li>• Reduced driving speed and comfort.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Protect the gravel layer.</li> <li>• Maintain good driving conditions.</li> <li>• Delay the need for regravelling.</li> </ul> <p>The activity includes maintenance of sand cushioning by 'blading' (i.e. spreading and levelling with grader) and shaping of the material on the entire roadway to form a smooth cushioning layer without irregularities.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The cushioning layer shall provide a smooth running surface without severe defects.</li> <li>• The gravel layer shall not be exposed to abrasion from traffic action and weather effects.</li> <li>• The sand cushioning layer shall at all times be between 10 and 40 mm in thickness and covering the entire roadway.</li> <li>• Sand cushioning maintenance shall be carried out within the response times given in table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Sand cushioning layer dispersed and < 10 mm thick in some areas	Without delay	Sand cushioning layer dispersed and < 10 mm thick in some areas	3 d	Sand cushioning layer dispersed and < 10 mm thick in some areas	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8310
<b>Activity</b>	Dry Grading	Code :	8313

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Inadequate cross fall, surface deformations, corrugation and potholes.</p> <p><b>Main Causes:</b> Inferior surface material, relatively high traffic volume and inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced driving speed.</li> <li>• Reduced driving comfort.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Remove surface unevenness and improve riding quality of gravel and earth roads.</li> </ul> <p>The activity includes grading by motor grader or towed grader to improve riding quality.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The dry graded surface shall be without deformation and have an acceptable profile in the opinion of the Engineer.</li> <li>• No water shall pond on the surface.</li> <li>• Corrugations shall not exceed 40 mm.</li> <li>• Crossfall shall be between 4 – 5 %.</li> <li>• At least P % of road length shall be of acceptable standard in the opinion of the Engineer.</li> <li>• Defective road lengths shall be corrected in accordance with response times given in the table below. For Dry Grading the response time shall be until the dry grading operations start.</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
P = 95	1 w	P = 85	2 w	P = 75	3 w
Corrugations > 40 mm	1 w	Corrugations > 40 mm	2 w	Corrugations > 40 mm	3 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8310
<b>Activity</b>	Unpaved Roadway Pothole Patching	Code :	8314

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Potholes in unpaved roadway surface, applicable to gravel and earth road, excluding sand track.</p> <p><b>Main Causes:</b> Inferior surfacing material, lack of maintenance, insufficient subgrade support, traffic action.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazards.</li> <li>• Water penetration into pavement layers (when applicable) and subgrade which reduces bearing capacity and accelerates deterioration.</li> <li>• Ponding of water on roadway.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Arrest surface defects in order to maintain traffic safety.</li> <li>• Restore riding quality.</li> </ul> <p>The activity includes repair of isolated potholes in the unpaved surface. Work consists of the vertical cutting, excavation and disposal of existing road structure, excavation and disposal of unsuitable material, and repair of the road structure, all in accordance with MSSRBW 8314.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The number of large potholes shall not be more than N1 per 1 km of road.</li> <li>• The number of small potholes shall not be more than N2 per km of road</li> <li>• "Large Potholes" are defined as depressions with an area of 0.18 m<sup>2</sup> or greater and a depth greater than 100 mm.</li> </ul> <p>Pothole patching shall be carried out in accordance with the threshold levels and response times given in the table below:</p>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
N1 = 0	Without delay	N1 = 0	Without delay	N1 = 0	Without delay
N2 = 3	2 d	N2 = 4	3 d	N2 = 6	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8310
<b>Activity</b>	Unpaved Roadway Erosion Runnels Repair	Code :	8315

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Erosion runnels in roadway surface,</p> <p><b>Main Causes:</b> Inferior pavement material, lack of maintenance, severe weather conditions.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazards.</li> <li>• Water penetration into pavement layers and subgrade which reduces bearing capacity and accelerates deterioration.</li> <li>• Ponding of water on roadway.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Arrest surface defects in order to maintain traffic safety.</li> <li>• Restore riding quality.</li> </ul> <p>The activity includes repair of erosion runnels in the unpaved roadway surface.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• There shall be no erosion runnels on the roadway.</li> <li>• Erosion runnels deeper than 50 mm shall be repaired in accordance with the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Erosion runnels > 50 mm in the roadway	1 w	Erosion runnels > 50 mm in the roadway	2 w	Erosion runnels > 50 mm in the roadway	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY ROUTINE MAINTENANCE	CODE:	8310
<b>Activity</b>	Dust Prevention	Code :	8316

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Dusty roads.</p> <p><b>Main Causes:</b> Inferior surface material, heavy traffic, severe wind conditions.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced driving speed.</li> <li>• Reduced driving comfort.</li> <li>• Health and safety hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Allay dusty conditions on gravel roads and other unpaved roads.</li> </ul> <p>The activity includes applying moisture or chemical stabilization on areas designated by the Engineer to prevent dust.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The completed treatment shall provide a smooth and relatively dust free surface</li> <li>• Dusty road lengths in the opinion of the Engineer shall be corrected in accordance with response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Dusty condition that is health and traffic safety hazard	2 w	Dusty condition that is health and traffic safety hazard	3 w	Dusty condition that is health and traffic safety hazard	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY PERIODIC MAINTENANCE	CODE:	8320

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8321 Wet Grading</li> <li>8322 Reshaping</li> <li>8323 Regravelling</li> <li>8324 Sand Cushioning</li> <li>8329 Other Unpaved Roadway Periodic Maintenance</li> </ul> <p>Activity 8329 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8321 to 8329.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8320 shall be as shown in the table below:</p>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
Average traffic speed < 60 km/h	1 w	Average traffic speed < 50 km/h	2 w	Average traffic speed < 40 km/h	3 w
Road corrugation amplitude ≥ 40 mm	1 w	Road corrugation amplitude ≥ 40 mm	2 w	Road corrugation amplitude ≥ 40 mm	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY PERIODIC MAINTENANCE	CODE:	8320
<b>Activity</b>	Wet Grading	Code :	8321

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Loss of roadway width, loss of crossfall, corrugations, potholes, rutting on gravel road.</p> <p><b>Main Causes:</b> Inferior surface material, weather conditions, lack of maintenance, traffic action.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Reduced driving speed.</li> <li>• Reduced driving comfort.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Reinststate correct unpaved roadway profile.</li> <li>• Improve riding conditions.</li> </ul> <p>The activity consists of grading, watering and compaction. It does not include scarifying or addition of imported gravel/ material from outside the work site to build up to correct crossfall.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The completed treatment of wet grading shall provide a smooth, stable and safe roadway surface.</li> <li>• Crossfall elevation shall be at between 3 – 4 %, or as instructed by the engineer.</li> <li>• Road corrugation amplitude shall not be more than 40 mm.</li> <li>• Rut depth shall not be more than A mm.</li> <li>• There shall not be more than N number of large potholes, i.e. with an area of 0.18 m<sup>2</sup> and a depth greater than 100 mm per 100 m of road.</li> <li>• Wet grading shall be carried out as directed by the Engineer in accordance with the RD's guidelines for periodic maintenance interventions and in accordance with the response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
Crossfall < 3 , or > 4 %	2 w	Crossfall < 3 , or > 4 %	3 w	Crossfall < 3 , or > 4 %	4 w
Corrugation > 40 mm	2 w	Corrugation > 40 mm	3 w	Corrugation > 40 mm	4 w
Rut Depth: A = 40	2 w	Rut Depth: A = 50	3 w	Rut Depth: A = 60	4 w
Potholes: N = 10	2 w	Potholes: N = 15	3 w	Potholes: N = 20	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY PERIODIC MAINTENANCE	CODE:	8320
<b>Activity</b>	Reshaping	Code :	8322

### Defects, Main Causes and Effects

**Defects:** Loss of roadway width, loss of crossfall, corrugations, potholes, rutting on earth road and sand track.

**Main Causes:** Inferior material, weather conditions, relatively high traffic volume and lack of maintenance.

**Effects:**

- Traffic hazard.
- Reduced driving speed.
- Reduced driving comfort.
- Limited passability.

### Purpose and Description

The purpose of this activity is to:

- Reinststate correct earth/sand track roadway profile.
- Improve riding conditions.

The activity consists of reshaping the roadway using a grader or by labour based method. Reshaping takes place normally during the rainy season when the soil/sand is moist/wet, and when the plant used can be easily manoeuvred.

### Service Quality Standard

- The completed treatment shall provide a smooth, stable and safe roadway surface.
- Crossfall elevation shall be between 3 – 4 %, or as directed by the engineer.
- Road corrugation amplitude shall not be more than 40 mm.
- Reshaping shall be carried out as directed by the Engineer in accordance with the RD's guidelines for periodic maintenance interventions and in accordance with the response times given in the table below:

### Threshold Level – Response Time

Service Level A		Service Level B		Service Level C	
Threshold Level	Response Time	Threshold Level	Response Time	Threshold Level	Response Time
Crossfall < 3 , or > 4 %	2 w	Crossfall < 3 , or > 4 %	3 w	Crossfall < 3 , or > 4 %	4 w
Corrugation > 40 mm	2 w	Corrugation > 40 mm	3 w	Corrugation > 40 mm	4 w

### Defect – Response Time

Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
Sand track profile too deep and sand too loose in the opinion of the Engineer.	2 w	Sand track profile too deep and sand too loose in the opinion of the Engineer.	3 w	Sand track profile too deep and sand too loose in the opinion of the Engineer.	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY PERIODIC MAINTENANCE	CODE:	8320
<b>Activity</b>	Regravelling	Code :	8323

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Excessive loss of gravel on a gravel road.</p> <p><b>Main Causes:</b> Traffic abrasion, weather conditions, continuous dry grading and in other cases lack of maintenance, traffic action.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard.</li> <li>• Reduced driving speed.</li> <li>• Reduced driving comfort.</li> <li>• Reduced pavement strength.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Reinstate correct unpaved roadway profile and pavement strength.</li> <li>• Improve riding conditions.</li> </ul> <p>The activity consists of addition of imported material to the road surface, placing and spreading approved material to reinstate the correct profile and gravel thickness, including scarifying and removal of any vegetation and preparation of the existing formation, watering and compaction.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The completed treatment shall provide a smooth, stable and safe roadway surface.</li> <li>• Gravel thickness shall be more than P % of design gravel thickness.</li> <li>• Crossfall shall be between 3 – 4 %, or as directed by the engineer.</li> <li>• Regravelling shall be carried out as directed by the Engineer in accordance with the RD's guidelines for periodic maintenance interventions and in accordance with the response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
P = 40	4 w	P = 40	4 w	P = 40	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED ROADWAY PERIODIC MAINTENANCE	CODE:	8320
<b>Activity</b>	Sand Cushioning	Code :	8324

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Exposed gravel wearing course.</p> <p><b>Main Causes:</b> Dislodged sand cushioning material, caused by traffic action and weater condition.</p> <p><b>Effects:</b></p> <p>Traffic hazard.</p> <ul style="list-style-type: none"> <li>• Reduced driving speed.</li> <li>• Reduced driving comfort.</li> <li>• Damage on wearing course.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Improve riding conditions.</li> <li>• Maintain a smooth surface.</li> <li>• Re-establish the sand cushioning layer and protect the gravel wearing course.</li> <li>• Prevent rapid deterioration of the gravel wearing course.</li> </ul> <p>The activity consists of providing and maintaining a uniformly distributed layer of sand over the entire roadway surface on gravel roads to provide a cushion to protect the gravel wearing course.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The completed treatment shall provide a smooth, stable and safe roadway surface.</li> <li>• The sand cushioning layer shall be restored to 40 mm thickness.</li> <li>• Sand Cushioning shall be carried out according to the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Sand cushioning layer insufficient in the opinion of the Engineer	2 w	Sand cushioning layer insufficient in the opinion of the Engineer	3 w	Sand cushioning layer insufficient in the opinion of the Engineer	4 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED FOOTPATH AND CYCLE PATH MAINTENANCE	CODE:	8330

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8331 Unpaved Footpath and Cycle Path Cleaning</li> <li>8332 Unpaved Footpath and Cycle Path General Surface Repair</li> <li>8339 Other Unpaved Footpath and Cycle Path Maintenance</li> </ul> <p>Activity 8339 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8331 to 8339.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8330 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Dirt and debris accumulation	1 w	Dirt and debris accumulation	2 w	Dirt and debris accumulation	3 w
Bumps or depressions with a vertical depth differential $\geq 75$ mm over a 2 m length	1 w	Bumps or depressions with a vertical depth differential $\geq 75$ mm over a 2 m length	2 w	Bumps or depressions with a vertical depth differential $\geq 75$ mm over a 2 m length	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE:	8300
<b>INTERVENTION</b>	UNPAVED FOOTPATH AND CYCLE PATH MAINTENANCE	CODE:	8330
<b>Activity</b>	Unpaved Footpath and Cycle Path Cleaning	Code :	8331

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Loose sand, stones, aggregates, unwanted vegetation, litter and debris on footpaths or cycle paths.</p> <p><b>Main Causes:</b> Loose sand allowed to accumulate, wind and storm water depositions of debris, spillage from vehicles.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard.</li> <li>• Ponding of water on paths.</li> <li>• Unwanted vegetation growth.</li> <li>• Nuisance for users</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain a safe and pleasing appearance of the footpaths and cycle paths.</li> <li>• Clean soil and other deposits to prevent ponding and vegetation growth.</li> </ul> <p>The activity includes all works associated with removing soil, loose sand, stones, aggregates and other debris from footpaths and cycle paths surfaces.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The footpath and cycle path surfaces must always be clean and free of soil, loose sand, stones, aggregates, debris, litter and other objects.</li> <li>• Unpaved Footpath and Cycle Path Cleaning shall be carried out within the maximum response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Dirt and debris accumulation	1 w	Dirt and debris accumulation	2 w	Dirt and debris accumulation	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	UNPAVED ROADWAY	CODE: 8300
<b>INTERVENTION</b>	UNPAVED FOOTPATH AND CYCLE PATH MAINTENANCE	CODE: 8330
<b>Activity</b>	Unpaved Footpath and Cycle Path General Surface Repair	Code : 8332

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Rutting and/ or depressions in footpaths and cycle paths and inadequate crossfall.</p> <p><b>Main Causes:</b> Inferior material, lack of maintenance, lack of subgrade support.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard.</li> <li>• Ponding of water on paths.</li> <li>• Nuisance to users.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Arrest defects in order to maintain a safe and pleasing appearance, and comfort to users.</li> </ul> <p>The activity includes filling of ruts and depressions, repairing local defects, maintaining adequate crossfall to maintain smooth surfacing for traffic safety.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Bumps or depressions shall not exceed 75 mm measured as space between a 2 m straight edge placed perpendicularly across path.</li> <li>• General Surface Repair shall be done within the maximum response times for defects given in the table below</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Bumps or depressions with a vertical depth differential of 75 mm or more over a 2 m length	1 w	Bumps or depressions with a vertical depth differential of 75 mm or more over a 2 m length	2 w	Bumps or depressions with a vertical depth differential of 75 mm or more over a 2 m length	2 w
Water ponding on paths caused by surface depressions or inadequate crossfall	1 w	Water ponding on paths caused by surface depressions or inadequate crossfall	2 w	Water ponding on paths caused by surface depressions or inadequate crossfall	2 w

## Maintenance Standards for Road and Bridge Works

### 8400 DRAINAGE FACILITIES

#### 8401 Scope

Feature 8400 Drainage Facilities covers routine maintenance interventions and activities to keep culverts and drains and associated drainage elements free of debris and in good repair to ensure free flow of water. It covers all types of culverts, including metal, concrete, wooden or polystyrene and all types of drains including side drains, median drains, cut-off drains, mitre drains and rectangular covered drains. It also covers cleaning, repair and necessary replacement and/ or relaying of catchpits, manholes and subsurface drainage in urban areas. All periodic maintenance activities shall generally be carried out in accordance with Standard Specifications for Road and Bridge Works when required and as directed by the Engineer.

The feature "Drainage Facilities" shall be defined as per the Botswana Road Design Manual (BRDM) and the Standard Specifications for Road and Bridge Works (SSRBW).

Feature 8400 Drainage Facilities covers the following interventions and activities:

#### 8410 Culvert Maintenance

- 8411 Culvert Cleaning
- 8412 Culvert Headwall, Wing Wall and Marker Post Repainting
- 8413 Culvert Headwall, Wing Wall, Inlet and Outlet Structure Repair
- 8414 Culvert Repair
- 8415 Culvert Marker Post Reinstatement/Replacement
- 8416 Culvert Marker Post Reflector Replacement
- 8419 Other Culvert Maintenance

#### 8420 Drain Maintenance

- 8421 Drain Clearing, Cleaning, and Desilting
- 8422 Unlined Drain Erosion Repair
- 8423 Unlined Drain Reshaping
- 8424 Drain Lining Repair
- 8425 Concrete Lining Joints Repair
- 8426 Concrete Lining Weep Holes Cleaning
- 8427 Drain Cover Repair/Replacement
- 8429 Other Drain Maintenance

#### 8430 Catchpit, Manhole and Drainage Pipe Maintenance

- 8431 Catchpit, Manhole and Drainage Pipe Cleaning and Clearing
- 8432 Manhole/Catchpit Cover Replacement
- 8433 Drainage Pipe Relaying/Replacement
- 8434 Catchpit/Manhole Repair
- 8435 Drainage Pipe Repair
- 8439 Other Catchpit, Manhole and Drainage Pipe Maintenance

### **8440 Erosion Protection Works Maintenance**

- 8441 Stone Pitching Repair
- 8442 Concrete Erosion Protection Works Repair
- 8443 Gabion Repair
- 8444 Scour Check and Chute Repair
- 8445 Berm Maintenance
- 8449 Other Erosion Protection Works Maintenance

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CULVERT MAINTENANCE	CODE:	8410

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8411 Culvert Cleaning</li> <li>8412 Culvert Headwall, Wing Wall and Marker Post Repainting</li> <li>8413 Culvert Headwall, Wing Wall, Inlet and Outlet Structure Repair</li> <li>8414 Culvert Repair</li> <li>8415 Culvert Marker Post Reinstatement/Replacement</li> <li>8416 Culvert Marker Post Reflector Replacement</li> <li>8419 Other Culvert Maintenance</li> </ul> <p>Activity 8419 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8411 to 8419.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8410 shall be as shown in the table below:</p>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
Sediments > 20 % of diameter/ height	1 w	Sediments > 30 % of diameter/ height	2 w	Sediments > 30 % of diameter/ height	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CULVERT MAINTENANCE	CODE:	8410
<b>Activity</b>	Culvert Cleaning	Code :	8411

<b>Defects, Main Causes and Effects</b>	
<p><b>Defects:</b> Accumulation of silt/debris, dirt on headwalls, wing walls and culvert inlets and outlets.</p> <p><b>Main Causes:</b> Weather conditions, too flat gradient in the culverts or, too flat or silted outlet drains and inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Impeded flow of water caused by blocked culverts due to silt or debris.</li> <li>• Overflow can damage road.</li> <li>• Traffic hazard.</li> <li>• Unattractive appearance.</li> </ul>	
<b>Purpose and Description</b>	
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Extend the life of the maintenance feature.</li> <li>• Maintain unimpeded flow of water through the structure.</li> <li>• Prevent damage to the roadway or the structures.</li> <li>• Maintain traffic safety.</li> <li>• Restore an attractive appearance.</li> </ul> <p>The activity includes all work to clean culverts made from metal, concrete, wood, polystyrene and all other materials. It includes cleaning of soil and debris (tree branches, bushes, etc.) and deposits from culvert barrel, wing walls, headwalls, culvert markers and inlet/outlet structures to ensure free and quick passage of water, and cleanliness of the culvert and its fixtures for visibility purposes, including disposal of all cleaned out materials to approved site.</p>	
<b>Service Quality Standard</b>	
<ul style="list-style-type: none"> <li>• Culverts shall at all times effectively transport water under the road without causing damage to the roadway or the structures themselves, and be without defects jeopardising the functionality or safety of the structures, nor the safety of traffic.</li> <li>• All culverts shall be cleaned and put in good repair before start of the rainy season. During the rainy season the culverts must be regularly inspected for objects and debris threatening to block the flow of water. Defects of culverts shall be repaired in accordance with response times given in the tables below.</li> <li>• Culvert cleaning shall be carried out if sediments at any point in the culvert fill the opening by more than P % of the diameter/height, as set out in tables below:</li> </ul>	

## Maintenance Standards for Road and Bridge Works

Defect – Response Time					
Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
Accumulation of silt or debris impeding free flow	1 w	Accumulation of silt or debris impeding free flow	2 w	Accumulation of silt or debris impeding free flow	3 w
Dirty and soiled culvert elements	2 w	Dirty and soiled culvert elements	3 w	Dirty and soiled culvert elements	4 w

Threshold Level - Response Time					
Service Level A		Service Level B		Service Level C	
Threshold Level	Response Time	Threshold Level	Response Time	Threshold Level	Response Time
P = 20	1 w	P = 30	2 w	P = 30	3 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CULVERT MAINTENANCE	CODE:	8410
<b>Activity</b>	Culvert Headwall, Wing Wall and Marker Post Repainting	Code :	8412

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Paint worn out, faded or missing.</p> <p><b>Main Causes:</b> Worn by weather or damaged by traffic, inadequate maintenance or poor workmanship.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Difficult driving conditions, especially at night and under low visibility.</li> <li>• Traffic safety reduced.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance optical guidance for the driver of a vehicle.</li> <li>• Serve as guidance, particularly in curves and at crests, where marker posts due to its height will be visible further ahead than road markings.</li> </ul> <p>The activity includes all work required to repaint culvert headwalls, wing walls and marker posts used on culverts.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Culvert Headwalls, Wing Walls and Marker Posts Repainting shall be done when more than P % of the paint is worn out or faded.</li> <li>• Repainting shall be started within the response times given in the table below:</li> </ul>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
P = 20	2 w	P = 30	3 w	P = 40	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CULVERT MAINTENANCE	CODE:	8410
<b>Activity</b>	Culvert Headwall, Wing Wall, Inlet and Outlet Structure Repair	Code :	8413

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged culvert headwalls, wing walls or inlet and outlet structures.</p> <p><b>Main Causes:</b> Inferior materials, vandalism, traffic accidents, poor workmanship or inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage may threaten stability of structure.</li> <li>• May impede free flow of water.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Extend the life of the drainage facility.</li> <li>• Maintain the unimpeded flow of water through the structure.</li> <li>• Prevent slippage of retained material.</li> <li>• Prevent damage to the roadway or the structures.</li> <li>• Maintain traffic safety.</li> </ul> <p>The activity includes all work required to repair culverts headwalls, wing walls, inlet and outlet structures whether made from metal, concrete, wood, polystyrene and all other materials.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Culverts shall at all times effectively transport water under the road without causing damage to the roadway or the structures themselves and be without defects jeopardising the functionality or safety of the structures.</li> <li>• General defects include but are not limited to; worn, bent, broken or otherwise damaged headwalls and wing walls; and inlet and outlet scour.</li> <li>• Defects of culvert headwalls, wing walls and inlet and outlet structures shall be repaired in accordance with response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Headwall movement away from the culvert	1 w	Headwall movement away from the culvert	2 w	Headwall movement away from the culvert	2 w
Cracks, corrosion and other evidence of deterioration of the structure	2 w	Cracks, corrosion and other evidence of deterioration of the structure	3 w	Cracks, corrosion and other evidence of deterioration of the structure	3 w
Other defects	3 w	Other defects	4 w	Other defects	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CULVERT MAINTENANCE	CODE:	8410
<b>Activity</b>	Culvert Repair	Code :	8414

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged culvert or metal culvert corroded.</p> <p><b>Main Causes:</b> Inferior materials, effect of weather or traffic action, poor workmanship or inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Impeded flow of water caused by damaged or blocked culverts due to silt or debris.</li> <li>• Overflow can damage road.</li> <li>• Reduced pavement strength.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Extend the life of the drainage facilities.</li> <li>• Maintain unimpeded flow of water through the structure.</li> <li>• Prevent damage to the roadway or the structures.</li> <li>• Maintain traffic safety.</li> </ul> <p>The activity includes all work required to repair culverts made from metal, concrete, wood, polystyrene and all other materials.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Culverts shall at all times effectively transport water under the road without causing damage to the roadway or the structures themselves and be without defects jeopardising the functionality or safety of the structures, nor a hazard to traffic.</li> <li>• Defects of culverts shall be repaired in accordance with response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Collapsed culvert	Without delay	Collapsed culvert	Without delay	Collapsed culvert	Without delay
Cracks, corrosion and other evidence of deterioration of the concrete or any other material	1 w	Cracks, corrosion and other evidence of deterioration of the concrete or any other material	2 w	Cracks, corrosion and other evidence of deterioration of the concrete or any other material	2 w
Loss or displacement of hand-laid and grouted rip-rap	2 w	Loss or displacement of hand-laid and grouted rip-rap	3 w	Loss or displacement of hand-laid and grouted rip-rap	4 w
Scouring around inlets and outlets	2 w	Scouring around inlets and outlets	3 w	Scouring around inlets and outlets	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CULVERT MAINTENANCE	CODE:	8410
<b>Activity</b>	Culvert Marker Post Reinstatement/Replacement	Code :	8415

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or missing marker post on culverts, or marker posts out of alignment.</p> <p><b>Main Causes:</b> Damaged by weather effects or damaged by traffic, vandalism or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Difficult driving conditions, especially at night and under low visibility.</li> <li>• Traffic safety reduced.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance optical guidance for the driver of a vehicle.</li> <li>• Assist the driver in perceiving the geometrics of the road when driving under low visibility.</li> <li>• Serve as the only functional guidance when road markings are dirty or covered by sand/silt or other contaminations.</li> <li>• Serve as guidance, particularly in curves and at crests, where marker posts due to its height will be visible further ahead than road markings.</li> <li>• Assist in identification of culvert locations.</li> </ul> <p>The activity includes all work required to reinstate damaged or replacing missing marker posts used on culverts.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The tops of posts shall not be out of alignment with the general line of posts by more than 75 mm, and posts shall not be out of plumb by more than 75 mm.</li> <li>• All posts shall be sound and solidly set in the ground.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged or missing marker posts	Without delay	Damaged or missing marker posts	Without delay	Damaged or missing marker posts	Without delay
Culvert marker post out of alignment	2 w	Culvert marker post out of alignment	2 w	Culvert marker post out of alignment	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CULVERT MAINTENANCE	CODE:	8410
<b>Activity</b>	Culvert Marker Post Reflector Replacement	Code :	8416

### Defects, Main Causes and Effects

**Defects:** Reflectors worn out or missing on culvert marker posts.  
**Main Causes:** Worn by weather, damaged by traffic, vandalism and lack of maintenance.  
**Effects:**

- Difficult driving conditions, especially at night and under poor visibility.
- Traffic safety reduced.

### Purpose and Description

The purpose of this activity is to:

- Enhance optical guidance for the driver of a vehicle.
- Assist the driver in perceiving the geometrics of the road when driving under poor visibility.
- Serve as the only functional guidance when road markings are dirty or covered by sand/silt or other contaminations
- Serve as guidance, particularly in curves and at crests, where marker posts due to its height will be visible further ahead than road markings.

The activity includes all work required to replace reflectors on marker posts used on culverts.

### Service Quality Standard

- Reflectors on marker posts shall be visible from a distance of at least L m when travelling in full darkness and with full lights on.
- Reflectors shall be in place and in good condition.
- Defects shall be repaired for the threshold levels and within the response times given in the tables below:

### Threshold Levels – Response Time

Service Level A		Service Level B		Service Level C	
Threshold Level	Response Time	Threshold Level	Response Time	Threshold Level	Response Time
L = 150	1 w	L = 150	2 w	L = 150	3 w

### Defect – Response Time

Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
Missing or worn out reflector	Without delay	Missing or worn out reflector	Without delay	Missing or worn out reflector	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	DRAIN MAINTENANCE	CODE:	8420

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8421 Drain Clearing, Cleaning and Desilting</li> <li>8422 Unlined Drain Erosion Repair</li> <li>8423 Unlined Drain Reshaping</li> <li>8424 Drain Lining Repair</li> <li>8425 Concrete Lining Joints Repair</li> <li>8426 Concrete Lining Weep Holes Cleaning</li> <li>8427 Drain Cover Repair/Replacement</li> <li>8429 Other Drain Maintenance</li> </ul> <p>Activity 8429 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8421 to 8429.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8420 shall be as shown in the table below:</p>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
As built depth reduced by more than 20 %	2 w	As built depth reduced by more than 30 %	3 w	As built depth reduced by more than 30 %	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	DRAIN MAINTENANCE	CODE:	8420
<b>Activity</b>	Drain Clearing, Cleaning and Desilting	Code :	8421

<b>Defects, Main Causes and Effects</b>	
<p><b>Defects:</b> Silt/sand deposits in drains and debris obstructing channels, unwanted vegetation growth in channels.</p> <p><b>Main Causes:</b> Inferior materials or workmanship, inadequate slope of drains, natural vegetation growth, insufficient resistance of drains and channels to water action, drains too small, or inadequate maintenance or other obstruction to drains.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Impeded flow of water caused by damaged or blocked drains due to silt, debris, unwanted vegetation growth or other obstructions.</li> <li>• Overflow can damage road, culverts or other drainage structures.</li> <li>• Reduced pavement strength.</li> <li>• Traffic hazard.</li> </ul>	
<b>Purpose and Description</b>	
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure effective transport of surface water, and drainage of the pavement structure and adjacent areas.</li> <li>• Keep water from saturating the subgrade.</li> <li>• Prevent erosion of the roadway by surface water.</li> <li>• Control and remove surface water from within the road reserve limits and surrounding area.</li> <li>• Prevent erosion of shoulders and side slopes.</li> <li>• Control and remove unwanted vegetation.</li> </ul> <p>The activity includes all work required to remove sediment, debris and other obstructions and reshape the drainage channels in order to restore the proper gradient, hydraulic capacity and unimpeded flow of water. The activity covers work on all types of drains, including but not limited to side drains, median drains, cut-off drains, mitre drains and covered drains. It includes making minor repairs to short sections of paved or lined drainage channels, scour checks and eroded drains to prevent development of major damages.</p>	
<b>Service Quality Standard</b>	
<ul style="list-style-type: none"> <li>• Drains shall be cleaned whenever the “as built” depth at any point is reduced more than P %.</li> <li>• Drains shall be cleared whenever height of vegetation exceeds H mm.</li> <li>• Culverts shall be cleared, cleaned and desilted in accordance with response times given in the tables below:</li> </ul>	

## Maintenance Standards for Road and Bridge Works

Threshold Levels – Response Time					
Service Level A		Service Level B		Service Level C	
Threshold Level	Response Time	Threshold Level	Response Time	Threshold Level	Response Time
P = 30	2 w	P = 30	3 w	P = 40	4 w
H = 300	2 w	H = 400	3 w	H = 500	4 w

Defect – Response Time					
Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
Water over-flowing onto roadway	Without delay	Water over-flowing onto roadway	Without delay	Water over-flowing onto roadway	Without delay
Insufficient grade, or blockage in drains	2 w	Insufficient grade, or blockage in drains	3 w	Insufficient grade, or blockage in drains	4 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	DRAIN MAINTENANCE	CODE:	8420
<b>Activity</b>	Unlined Drain Erosion Repair	Code :	8422

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Drains damaged by erosion.</p> <p><b>Main Causes:</b> Steep gradient, severe weather conditions, inferior materials, poor workmanship or inadequate maintenance.</p> <p><b>Effect:</b></p> <ul style="list-style-type: none"> <li>• Impeded flow of water through drains.</li> <li>• Erosion of roadway, shoulders and side slopes..</li> <li>• Saturation of pavement layers.</li> <li>• Overflow can damage road.</li> <li>• Reduced pavement strength.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure effective transport of surface water and drainage of the pavement structure and adjacent areas.</li> <li>• Keep water from saturating the subgrade.</li> <li>• Avoid that water erode the roadway.</li> <li>• Control and remove surface water within the road reserve limits and surrounding area.</li> <li>• Prevent erosion of shoulders and side slopes.</li> </ul> <p>The activity includes all work required to prevent erosion and repair damaged unlined drains due to erosion, to restore the proper gradient, hydraulic capacity and unimpeded flow of water.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Unlined drains shall be fully functional and shall have no visible signs of erosion damage.</li> <li>• Erosion damage on unlined drains shall be repaired in accordance with response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Eroded or damaged drains, side-slopes, back-slopes and slope protection	3 w	Eroded or damaged drains, side-slopes, back-slopes and slope protection	4 w	Eroded or damaged drains, side-slopes, back-slopes and slope protection	5 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	DRAIN MAINTENANCE	CODE:	8420
<b>Activity</b>	Unlined Drain Reshaping	Code :	8423

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Erosion of side slopes and loss of drain cross-section profile.</p> <p><b>Main Causes:</b> Inferior materials, poor workmanship or inadequate maintenance.</p> <p><b>Effect:</b></p> <ul style="list-style-type: none"> <li>• Impeded flow of water through drains; ineffective drain.</li> <li>• Erosion of roadway, shoulders and side slopes.</li> <li>• Saturation of pavement layers.</li> <li>• Overflow can damage road.</li> <li>• Reduced pavement strength.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure effective transport of surface water and drainage of the pavement structure and adjacent areas.</li> <li>• Keep water from saturating the subgrade.</li> <li>• Avoid that water erode the roadway.</li> <li>• Control and remove surface water within the road reserve limits and surrounding area.</li> <li>• Restore drains to correct profile and level.</li> </ul> <p>The activity includes all work required to reshape unlined drains, either manually or by grader, by removing or adding material in order to obtain the correct cross-section and grade, and restore the drain to its full functionality.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Unlined drains shall be free of all material that could block the flow of water into the drain and along it. The drain shall be evenly shaped to allow water to flow to the outlet.</li> <li>• Unlined drains shall be reshaped whenever the "as built" depth at any point is reduced more than P %, in accordance with response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
P = 30	2 w	P = 30	3 w	P = 40	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	DRAIN MAINTENANCE	CODE:	8420
<b>Activity</b>	Drain Lining Repair	Code :	8424

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged drain lining.</p> <p><b>Main Causes:</b> Inferior materials, storm water damage, erosion, drain inadequate for runoff, accidental damage, poor workmanship or inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Erosion of drains.</li> <li>• Overflow can damage roadway, shoulders, side slopes.</li> <li>• Reduced pavement strength.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Protect sides of drains against scour or erosion.</li> <li>• Repair damaged drain linings before they impede the function of the lining.</li> <li>• Restore drain linings to prevent damage to roadway.</li> </ul> <p>The activity includes all work required to repair damaged sections of drain lining.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Drain linings shall be fully functional without damaged parts which jeopardise the purpose of the structure.</li> <li>• Drain linings shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged or missing lining	2 w	Damaged or missing lining	3 w	Damaged or missing lining	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	DRAIN MAINTENANCE	CODE:	8420
<b>Activity</b>	Concrete Lining Joints Repair	Code :	8425

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged concrete lining joints.</p> <p><b>Main Causes:</b> Inferior materials, poor workmanship or inadequate maintenance, heaving of material beneath lining.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Erosion of drains.</li> <li>• Overflow can damage roadway, shoulders and side slopes.</li> <li>• Reduced pavement strength.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Protect sides of drains against scour or erosion.</li> <li>• Repair damaged linings joints before they impede the function of the lining.</li> <li>• Restore drain lining joints to prevent further damage to drain lining and roadway.</li> </ul> <p>The activity includes all work required to repair concrete drain lining joints.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Concrete drain lining joints shall be sound and functional.</li> <li>• Concrete drain lining joints shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged lining joints	2 w	Damaged lining joints	3 w	Damaged lining joints	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	DRAIN MAINTENANCE	CODE:	8420
<b>Activity</b>	Concrete Lining Weep Holes Cleaning	Code :	8426

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Blocked weep holes in concrete lining.</p> <p><b>Main Causes:</b> Inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Erosion of drains.</li> <li>• Overflow can damage road.</li> <li>• Reduced pavement strength.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Protect sides of drains against scour or erosion.</li> <li>• Ensure proper drainage of water from behind the concrete lining.</li> <li>• Reduce active earth pressure on lining.</li> </ul> <p>The activity includes all work required to clean weep holes and remove all blockages to ensure its proper functioning.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Concrete lining weep holes shall be open and functional.</li> <li>• Concrete lining weep holes shall be cleaned within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Blocked weep holes	2 w	Blocked weep holes	3 w	Blocked weep holes	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	DRAIN MAINTENANCE	CODE:	8420
<b>Activity</b>	Drain Cover Repair/Replacement	Code :	8427

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Missing, misaligned or damaged drain covers.</p> <p><b>Main Causes:</b> Accidents, vandalism, inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Hazard to road users.</li> <li>• Erosion and scour behind the lining.</li> <li>• Ingress of water behind the lining and eventual damage to the drain.</li> <li>• Blockage of drains.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Allow pedestrians to pass over drain without danger.</li> <li>• Ensure that drain covers are functional and in good repair.</li> <li>• Protect sides of drains against scour or erosion.</li> <li>• Prevent blockage of drains by debris, litter, etc.</li> </ul> <p>The activity includes all work required to realign, repair or replace (if necessary) drain covers, and remove all blockages to ensure its proper functioning.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Drain covers shall be in place and functional.</li> <li>• Drain covers shall be repaired, reinstated or replaced within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Missing or collapsed drain cover	Without delay	Missing or collapsed drain cover	Without delay	Missing or collapsed drain cover	Without delay
Misaligned drain cover	3 d	Misaligned drain cover	1 w	Misaligned drain cover	1 w
Damaged drain cover	2 w	Damaged drain cover	3 w	Damaged drain cover	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CATCHPIT, MANHOLE AND DRAINAGE PIPE MAINTENANCE	CODE:	8430

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8431 Catchpit, Manhole and Drainage Pipe Cleaning and Clearing</li> <li>8432 Manhole/Catchpit Cover Replacement</li> <li>8433 Drainage Pipe Relaying/Replacement</li> <li>8434 Catchpit/Manhole Repair</li> <li>8435 Drainage Pipe Repair</li> <li>8439 Other Catchpit, Manhole and Drainage Pipe Maintenance</li> </ul> <p>Activity 8439 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8431 to 8439.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8430 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Drainage not functional	1 w	Drainage not functional	2 w	Drainage not functional	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CATCHPIT, MANHOLE AND DRAINAGE PIPE MAINTENANCE	CODE:	8430
<b>Activity</b>	Catchpit, Manhole and Drainage Pipe Cleaning and Clearing	Code :	8431

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Clogged, silted catchpit, manhole or drainage pipe.</p> <p><b>Main Causes:</b> Weather action, vegetation growth, inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Failure to provide free flowing drainage.</li> <li>• Subgrade failures.</li> <li>• Hazard for road users.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure proper functioning of catchpits, manholes, drains inlets and outfalls and drainage pipes.</li> <li>• Provide efficient underground drainage of pavement surface water to prevent subdrain accumulations.</li> <li>• Protect side slopes by controlling water.</li> <li>• Ensure efficient outlet of underground drainage moisture to prevent subgrade failure.</li> </ul> <p>The activity includes all work required to clean and clear catchpits, manholes, drainage pipes, and their inlets and outlets.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Catchpits, manholes, drains inlets and outlets, and drainage pipes shall be fully functional.</li> <li>• Catchpit, Manhole and Drainage Pipe Cleaning and Clearing shall be cleaned and cleared within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Underground drainage blocked	1 w	Underground drainage blocked	2 w	Underground drainage blocked	2 w
Debris or silt filling up catchpit or manhole	1 w	Debris or silt filling up catchpit or manhole	2 w	Debris or silt filling up catchpit or manhole	2 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CATCHPIT, MANHOLE AND DRAINAGE PIPE MAINTENANCE	CODE:	8430
<b>Activity</b>	Manhole/Catchpit Cover Replacement	Code :	8432

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Missing or damaged covers on catchpits or manholes.</p> <p><b>Main Causes:</b> Damaged by vehicles or pedestrians, vandalism or inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Hazard for pedestrians.</li> <li>• Traffic hazard.</li> <li>• Open for ingress of debris.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Allow vehicles and pedestrians to pass over without danger.</li> <li>• Ensure that broken or missing covers are replaced without delay for purpose of traffic safety.</li> </ul> <p>The activity includes all work required to replace missing or damaged covers on catchpits or manholes.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Catchpits and manholes covers shall be intact and in place with no visible defects that can endanger pedestrians or traffic.</li> <li>• Manhole/catchpit covers shall be replaced within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Missing covers	Without delay	Missing covers	Without delay	Missing covers	Without delay
Damaged frames or covers	3 d	Damaged frames or covers	1 w	Damaged frames or covers	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CATCHPIT, MANHOLE AND DRAINAGE PIPE MAINTENANCE	CODE:	8430
<b>Activity</b>	Drainage Pipe Relaying/Replacement	Code :	8433

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged, broken or missing drainage pipes, and displaced/dislocated drainage pipes.</p> <p><b>Main Causes:</b> Heavy wheel loads, accidents, or inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Failure to provide free flowing drainage.</li> <li>• Failure in pavement layer and subgrade.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure proper functioning of drainage pipes made of concrete, steel, wood, polystyrene or any other material.</li> <li>• Provide efficient underground drainage of pavement surface water to prevent subdrain accumulations.</li> <li>• Intercept and collect sub-surface water.</li> <li>• Ensure efficient outlet of underground drainage moisture.</li> <li>• Prevent failure of pavement layers.</li> </ul> <p>The activity includes all works necessary to relay/replace underground drainage pipes that have become blocked or damaged.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Drainage pipes shall be fully functional.</li> <li>• Broken, damaged or blocked pipes shall be replaced, and displaced/dislocated pipes shall be relayed within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Broken, damaged or blocked pipes	1 w	Broken, damaged or blocked pipes	2 w	Broken, damaged or blocked pipes	2 w
Displaced or dislocated pipes	1 w	Displaced or dislocated pipes	2 w	Displaced or dislocated pipes	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CATCHPIT, MANHOLE AND DRAINAGE PIPE MAINTENANCE	CODE:	8430
<b>Activity</b>	Catchpit/Manhole Repair	Code :	8434

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged catchpits or manholes.</p> <p><b>Main Causes:</b> Damaged by vehicles or pedestrians, vandalism or inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Failure to provide free flowing drainage.</li> <li>• Failure in pavement/subgrade layers.</li> <li>• Hazard for pedestrians.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure proper functioning of catchpits and manholes.</li> <li>• Provide efficient underground drainage of pavement surface water.</li> <li>• Ensure efficient outlet of underground drainage moisture to prevent pavement layers failure.</li> </ul> <p>The activity includes all work required to repair catchpits and manholes, including backfill and restoration of pavement layers and shoulders as required.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Catchpits and manholes shall be fully functional without visible structural damage.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Settlement around inlets and outlets, catchpits and structure approaches	2 w	Settlement around inlets and outlets, catchpits and structure approaches	3 w	Settlement around inlets and outlets, catchpits and structure approaches	4 w
Defects in concrete work	2 w	Defects in concrete work	3 w	Defects in concrete work	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	CATCHPIT, MANHOLE AND DRAINAGE PIPE MAINTENANCE	CODE:	8430
<b>Activity</b>	Drainage Pipe Repair	Code :	8435

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged drainage pipes, or inadequate backfill cover.</p> <p><b>Main Causes:</b> Damaged by flooding, settlements, heavy vehicle loads, backfill cover, inadequate maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Failure to provide free flowing drainage.</li> <li>• Failure in pavement layers and subgrade.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure proper functioning drainage pipes made of concrete, steel, wood, polystyrene or any other material.</li> <li>• Provide efficient underground drainage of pavement surface water to prevent subdrain accumulations.</li> <li>• Ensure efficient outlet of underground drainage moisture to prevent subgrade failure.</li> </ul> <p>The activity includes all work to repair drainage pipes.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Drainage pipes shall be fully functional without structural damage.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Depressions along the drain, which may indicate a failure of the pipe	1 w	Depressions along the drain, which may indicate a failure of the pipe	2 w	Depressions along the drain, which may indicate a failure of the pipe	2 w
Damaged pipe not functional	1 w	Damaged pipe not functional	2 w	Damaged pipe not functional	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	EROSION PROTECTION WORKS MAINTENANCE	CODE:	8440

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8441 Stone Pitching Repair</li> <li>8442 Concrete Erosion Protection Works Repair</li> <li>8443 Gabion Repair</li> <li>8444 Scour Check and Chute Repair</li> <li>8445 Berm Maintenance</li> <li>8449 Other Erosion Protection Works Maintenance</li> </ul> <p>Activity 8449 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8441 to 8449.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8440 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Erosion protection not functional	1 w	Erosion protection not functional	2 w	Erosion protection not functional	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	EROSION PROTECTION WORKS MAINTENANCE	CODE:	8440
<b>Activity</b>	Stone Pitching Repair	Code :	8441

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged stone pitching for bridges and other drainage structures.</p> <p><b>Main Causes:</b> Incremental disappearance of soil caused by run-off conditions, sudden removal of soil caused by flood, fast run-off or progressive seepage or heaving.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Erosion damage to stone pitching for bridges and other drainage structures.</li> <li>• Failure in pavement layers and subgrade.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Control erosion of stone pitching for bridges and other drainage structures.</li> <li>• Keep stone pitching fully functional.</li> <li>• Protect roadway from deterioration.</li> </ul> <p>The activity includes all work necessary to repair stone pitching used as erosion protection works for bridges and other drainage structures to ensure scour protection, at bridge abutments, at toe of slopes, at culvert inlets and outlets and in drains that are susceptible to erosion.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Stone pitching shall be fully functional and shall have no visible defects that can endanger the structure or roadway or represent a potential hazard to road users.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Undermining of piers and abutments	1 w	Undermining of piers and abutments	2 w	Undermining of piers and abutments	2 w
Washouts at wing walls	1 w	Washouts at wing walls	2 w	Washouts at wing walls	3 w
Damage to stone pitching	1 w	Damage to stone pitching	2 w	Damage to stone pitching	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	EROSION PROTECTION WORKS MAINTENANCE	CODE:	8440
<b>Activity</b>	Concrete Erosion Protection Works Repair	Code :	8442

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged concrete erosion protection structures.</p> <p><b>Main Causes:</b> Incremental disappearance of soil caused by run-off conditions, sudden removal of soil caused by flood, fast run-off or progressive seepage.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Erosion damage along drains and other minor drainage structures.</li> <li>• Risk of damage to road.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Control erosion at erosion protection works installed at along drains and other minor drainage structures.</li> <li>• Keep erosion protection works fully functional to protect against damage to road.</li> </ul> <p>The activity includes all work necessary to repair concrete structures used as erosion protection works.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Concrete erosion protection works shall be fully functional and shall have no serious defects that can endanger the structure or roadway, or represent a potential hazard to road users.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Undermining of drainage structures	1 w	Undermining of drainage structures	2 w	Undermining of drainage structures	2 w
Washouts at wing walls	1 w	Washouts at wing walls	2 w	Washouts at wing walls	3 w
Damage to erosion protection works	1 w	Damage to erosion protection works	2 w	Damage to erosion protection works	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	EROSION PROTECTION WORKS MAINTENANCE	CODE:	8440
<b>Activity</b>	Gabion Repair	Code :	8443

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged gabion.</p> <p><b>Main Causes:</b> Incremental disappearance of soil caused by run-off conditions, sudden removal of soil caused by flood, fast run-off or progressive seepage.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Erosion damage to gabions.</li> <li>• Damage to road.</li> <li>• Damage to drains and other minor drainage structures.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Control erosion at erosion protection works where gabions are installed along drains, culverts or bridges.</li> <li>• Keep gabions fully functional to protect against damage to road and minor drainage structures.</li> </ul> <p>The activity includes all work necessary to repair gabions used as erosion protection works.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Gabion used for erosion protection shall be fully functional and shall have no defects that can endanger the structure or roadway, or represent a potential hazard to road users.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damage to, or undermining of drains and other minor drainage structures	1 w	Damage to, or undermining of drains and other minor drainage structures	2 w	Damage to, or undermining of drains and other minor drainage structures	2 w
Damage to gabion	1 w	Damage to gabion	2 w	Damage to gabion	3 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	EROSION PROTECTION WORKS MAINTENANCE	CODE:	8440
<b>Activity</b>	Scour Check and Chute Repair	Code :	8444

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Eroded scour checks and/or chutes along drains.</p> <p><b>Main Causes:</b> Incremental disappearance of soil caused by run-off conditions, sudden removal of soil caused by flood, fast run-off or progressive seepage.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Erosion damage to bridges and other drainage structures.</li> <li>• Damage to road.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Control erosion at scour checks and/or chutes along drains and erosion protection works installed at bridges and other drainage structures.</li> <li>• Keep erosion protection works fully functional to protect against damage to the road.</li> </ul> <p>The activity includes all work necessary to repair scour checks and chutes used as erosion protection.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Scour checks and chutes shall be fully functional and shall have no defects that can endanger the structure or roadway, or represent a potential hazard to road users.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Undermining of drainage structures	1 w	Undermining of drainage structures	2 w	Undermining of drainage structures	2 w
Washouts at wing walls	1 w	Washouts at wing walls	2 w	Washouts at wing walls	3 w
Defective scour check or chute	1 w	Defective scour check or chute	2 w	Defective scour check or chute	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	DRAINAGE FACILITIES	CODE:	8400
<b>INTERVENTION</b>	EROSION PROTECTION WORKS MAINTENANCE	CODE:	8440
<b>Activity</b>	Berm Maintenance	Code :	8445

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged berms functioning as cut-off for stormwater drainage.</p> <p><b>Main Causes:</b> Incremental disappearance of soil caused by run-off conditions, sudden removal of soil caused by flood, fast run-off or progressive seepage.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Erosion damage to road pavement, bridges and other structures.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Restore berm as cut-off barrier for drainage that may otherwise erode the drain or slope.</li> <li>• Keep erosion berms fully functional to protect against damage to the road, bridge or other structure.</li> </ul> <p>The activity includes all work necessary to repair or rebuild berms used as cut-off for stormwater drainage.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Berms shall be fully functional and shall have no defects that can endanger its purpose.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Berms washed out or missing	1 w	Berms washed out or missing	2 w	Berms washed out or missing	3 w
Damage on berms, not fully functional	1 w	Damage on berms, not fully functional	2 w	Damage on berms, not fully functional	3 w

## 8500 BRIDGES

### 8501 Scope

Feature 8500 Bridges covers routine maintenance activities to keep bridges clean and in good repair. The feature further covers periodic maintenance activities, such as replacement of bearings, major rust removal and replacement of components when required. All periodic maintenance activities shall generally be carried out in accordance with Standard Specifications for Road and Bridge Works when required and as directed by the Engineer, and as scheduled in accordance with Activity 8524 Bridge Inspection.

It covers both vehicular and foot/pedestrian/cycle path bridges and flyovers of all types of construction materials including steel, concrete and timber. Reference shall be made to Botswana Roads Department's Bridge Repair Material Specification Manual for approved materials for bridge repair works.

The feature "Bridges" shall be defined as per the Botswana Roads Design Manual (BRDM) and Standard Specifications for Road and Bridge Works (SSRBW).

("A structure erected over a depression, river, watercourse, railway line, road or other obstacles for carrying motor, railway, pedestrian or other traffic, or services, and having a length, measured between the abutment faces along the centre line at girder bed level, of 6 metres or more, except that road-over-rail or rail-over-road structures are always classified as bridges").

Feature 8500 Bridges covers the following interventions and activities:

### 8510 Bridge Routine Maintenance

- 8511 Bridge Deck Cleaning
- 8512 Bridge Joints, Scupper Drains and Weep Holes Cleaning
- 8513 Bridge Bearings Cleaning
- 8514 Bridge Erosion Repair
- 8515 Bridge Concrete Repair
- 8516 Bridge Wearing Surface Maintenance
- 8517 Bridge Rail, Safety Barrier and Parapet Maintenance and Minor Repairs
- 8518 Bridge Steel Component Repair
- 8519 Other Bridge Routine Maintenance

### 8520 Bridge Periodic Maintenance

- 8521 Bridge Bearings Realignment and Replacement
- 8522 Bridge Rust Removal and Repainting
- 8523 Bridge Steel Component Replacement
- 8524 Bridge Inspection
- 8529 Other Bridge Periodic Maintenance

### 8530 Waterway Maintenance and Repair

- 8531 Waterway Debris and Obstacles Removal
- 8532 Waterway Erosion Repair
- 8533 Waterway Desilting
- 8539 Other Waterway Maintenance and Repair

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE ROUTINE MAINTENANCE	CODE:	8510

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8511 Bridge Deck Cleaning</li> <li>8512 Bridge Joints, Scupper Drains and Weep Holes Cleaning</li> <li>8513 Bridge Bearings Cleaning</li> <li>8514 Bridge Erosion Repair</li> <li>8515 Bridge Concrete Repair</li> <li>8516 Bridge Wearing Surface Maintenance</li> <li>8517 Bridge Rail, Safety Barrier and Parapet Maintenance and Minor Repairs</li> <li>8518 Bridge Steel Component Repair</li> <li>8519 Other Bridge Routine Maintenance</li> </ul> <p>Activity 8519 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8511 to 8519.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8510 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Visible defects on bridges	As instructed by the Engineer	Visible defects on bridges	As instructed by the Engineer	Visible defects on bridges	As instructed by the Engineer

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE ROUTINE MAINTENANCE	CODE:	8510
<b>Activity</b>	Bridge Deck Cleaning	Code :	8511

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Accumulation of loose material and debris on bridge deck, including sidewalks.</p> <p><b>Main Causes:</b> Debris or other foreign material allowed to accumulate, traffic-induced soiling or material spilling, wind-blown or water-transported soil or debris.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Ponding of water on bridge deck, water penetrates and attacks structure.</li> <li>• Traffic hazard.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Keep the bridge deck free of loose material and debris.</li> <li>• Prevent water from ponding.</li> <li>• Ensure proper functioning of the bridge deck for traffic safety.</li> </ul> <p>The activity includes clearing and cleaning of bridge deck and consists of removal and disposal of all dirt, debris and deleterious material, and washing of bridge deck to remove all deleterious materials.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• After completed cleaning; all vegetation, sand, silt or other contaminations shall be removed.</li> <li>• Bridge Deck Cleaning shall be done within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Sand, silt or debris on bridge deck	1 w	Sand, silt or debris on bridge deck	2 w	Sand, silt or debris on bridge deck	3 w
Ponding of water on bridge deck	1 w	Ponding of water on bridge deck	2 w	Ponding of water on bridge deck	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE ROUTINE MAINTENANCE	CODE:	8510
<b>Activity</b>	Bridge Joints, Scupper Drains and Weep Holes Cleaning	Code :	8512

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Accumulation of dirt and silt or damaged/blocked joints, blocked scupper drains and weep holes.</p> <p><b>Main Causes:</b> Lack of maintenance, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Potentially unsafe conditions for road users.</li> <li>• Integrity of structure threatened.</li> <li>• Movement of bridge deck restricted.</li> <li>• Damage to joints, scupper drains and weep holes.</li> <li>• Poor drainage.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure proper functioning of the deck joints.</li> <li>• Ensure that structure deck joints allow controlled movement of the deck under live loading as well as thermal expansion and contraction.</li> <li>• Ensure that expansion joints will permit the structure to expand and contract.</li> <li>• Ensure that scupper drains and weep holes are open with free draining. The activity includes cleaning of bridge expansion joints, scupper drains and weep holes to remove all dirt, debris and deleterious materials.</li> </ul> <p>The activity includes cleaning of bridge expansion joints, scupper drains and weep holes to remove all dirt, debris and deleterious materials.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Expansion joints shall be clean and in good condition.</li> <li>• Scupper drains and weep holes shall be clean and functional.</li> <li>• Bridge joints, scupper drains and weep holes shall be cleaned within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Accumulation of dirt and silt or damaged joints	1 w	Accumulation of dirt and silt or damaged joints	2 w	Accumulation of dirt and silt or damaged joints	2 w
Clogged scupper drains or weep holes	1 w	Clogged scupper drains or weep holes	2 w	Clogged scupper drains or weep holes	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE ROUTINE MAINTENANCE	CODE:	8510
<b>Activity</b>	Bridge Bearings Cleaning	Code :	8513

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Accumulation of dirt, debris and other foreign materials on and around bearings.</p> <p><b>Main Causes:</b> Lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Potentially unsafe conditions for road users.</li> <li>• Movement of bridge deck restricted.</li> <li>• Integrity of structure threatened.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain bearings to ensure that the superstructure can undergo the necessary movements without developing damaging stresses.</li> <li>• Maintain load carrying capacity.</li> <li>• Extend bearing and bridge life.</li> </ul> <p>The activity includes all work to clean bridge bearings and includes cleaning and lubrication. (Realignment and replacement of bridge bearings are included in Activity 8521).</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Bridge bearings shall be clean, lubricated and in good condition</li> <li>• Bridge Bearings Cleaning shall be done within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Accumulation of unwanted material on and around bearings	1 w	Accumulation of unwanted material on and around bearings	2 w	Accumulation of unwanted material on and around bearings	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE ROUTINE MAINTENANCE	CODE:	8510
<b>Activity</b>	Bridge Erosion Repair	Code :	8514

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Erosion damage around bridges.</p> <p><b>Main Causes:</b> Lack of maintenance, accumulation of debris and obstacles, weather conditions, severe flooding.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Erosion around abutments and piers.</li> <li>• Integrity of structure threatened.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Prevent undermining and settlement or collapse of bridge foundations and road embankment.</li> <li>• Repair of stream bed or erosion around piers and abutments, and erosion structures at bridges.</li> <li>• Prolong the useful life of the bridge.</li> <li>• Ensure traffic safety.</li> </ul> <p>The activity includes all repair of damage caused by erosion and repair of erosion prevention structures at bridges.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The waterway immediately upstream and under bridges must be free of debris, silt or obstacles to allow free flow of water.</li> <li>• Design clearance under the bridge shall be kept.</li> <li>• Bridge Erosion Repair shall be done within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Severe erosion or damage to erosion prevention structures that affects integrity of structure	Without delay	Severe erosion or damage to erosion prevention structures that affects integrity of structure	Without delay	Severe erosion or damage to erosion prevention structures that affects integrity of structure	Without delay
Erosion prevention structures damaged	1 w	Erosion prevention structures damaged	2 w	Erosion prevention structures damaged	3 w
Erosion damage around structures	1 w	Erosion damage around structures	2 w	Erosion damage around structures	3 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE ROUTINE MAINTENANCE	CODE:	8510
<b>Activity</b>	Bridge Concrete Repair	Code :	8515

<b>Defects, Main Cause and, Effects</b>					
<p><b>Defects:</b> Damaged concrete superstructure, piers and abutments, excluding bridge deck surface.</p> <p><b>Main Causes:</b> Lack of maintenance, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Potentially unsafe conditions for road users.</li> <li>• Integrity of structure threatened.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure that bridge decks, piers and abutments, critical structural elements of bridges, are kept structurally sound.</li> <li>• Ensure traffic safety.</li> <li>• Prolong the useful life of the bridge.</li> </ul> <p>The activity includes all works in connection with repair of concrete superstructure, piers and abutments, excluding bridge deck surface.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Concrete superstructure, piers and abutments shall be structurally sound and free of defects.</li> <li>• Other defects include, but are not limited to cracking or spalling of bridge deck, footpath, cycle path or any other concrete bridge component.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects affecting structural integrity of the bridge	Without delay	Defects affecting structural integrity of the bridge	Without delay	Defects affecting structural integrity of the bridge	Without delay
Defects hazardous to road users	Without delay	Defects hazardous to road users	Without delay	Defects hazardous to road users	Without delay
Other defects	2 w	Other defects	3 w	Other defects	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE ROUTINE MAINTENANCE	CODE:	8510
<b>Activity</b>	Bridge Wearing Surface Maintenance	Code :	8516

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged bridge deck wearing surface.</p> <p><b>Main Causes:</b> Lack of maintenance, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Potentially unsafe conditions for road users.</li> <li>• Integrity of structure threatened.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Provide a uniform, even and durable wearing surface for vehicular traffic, and for pedestrians and cyclists.</li> <li>• Keep the bridge deck fully functional.</li> <li>• Ensure proper functioning of the bridge deck for traffic safety.</li> </ul> <p>The activity includes all works necessary to maintain the bridge deck wearing surface fully functional, whether it be a bituminous, concrete or timber surface.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All bridge deck systems shall be restored to a safe, durable, even and free-draining condition.</li> <li>• Bridge wearing surface shall be maintained within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects on bridge wearing surface	1 w	Defects on bridge wearing surface	2 w	Defects on bridge wearing surface	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE ROUTINE MAINTENANCE	CODE:	8510
<b>Activity</b>	Bridge Rail, Safety Barrier and Parapet Maintenance and Minor Repairs	Code :	8517

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged bridge rail, safety barrier or parapet, minor defects.</p> <p><b>Main Causes:</b> Lack of maintenance, accidents, vandalism, overtopping.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Potentially unsafe conditions for road users.</li> <li>• Integrity of structure threatened.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure safe barrier between vehicles and pedestrians.</li> <li>• Minor repairs include but will not be limited to repair of the following defects: bent, broken or missing posts, loose or missing fasteners, paint flaking off, cracking, spalling or visible rust spots on elements.</li> </ul> <p>The activity consists of maintenance of bridge rails, safety barriers and parapets including minor repairs of all installations.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Bridge rails, safety barriers and parapets shall be structurally sound and free of defects</li> <li>• Other defects include but are not limited to: corrosion of steel elements, spalling or cracking of concrete or masonry, decayed or split timber components, damaged paint.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects that create an unsafe situation for road users, or affects the integrity of the structure	Without delay	Defects that create an unsafe situation for road users, or affects the integrity of the structure	Without delay	Defects that create an unsafe situation for road users, or affects the integrity of the structure	Without delay
Other defects	2 w	Other defects	3 w	Other defects	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE ROUTINE MAINTENANCE	CODE:	8510
<b>Activity</b>	Bridge Steel Component Repair	Code :	8518

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged structural steel components on bridges.</p> <p><b>Main Causes:</b> Lack of maintenance, accidents, vandalism.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Potentially unsafe conditions for road users.</li> <li>• Integrity of structure threatened.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure that all bridge structural steel components are safe and well functioning.</li> </ul> <p>The activity consists of minor routine maintenance repairs on all steel components on bridges, such as tightening of nuts, bolts and plates. Also repair of corrosion protection and reinstatement/replacement of minor components. It does not include scheduled major repair.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Bridge steel components shall be structurally sound and free of defects.</li> <li>• Other defects include but are not limited to: cracked, delaminated, scaled, spalled, bent, loose or corroded elements.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects that create an unsafe situation for road users, or affects the integrity of the structure	Without delay	Defects that create an unsafe situation for road users, or affects the integrity of the structure	Without delay	Defects that create an unsafe situation for road users, or affects the integrity of the structure	Without delay
Other defects	2 w	Other defects	3 w	Other defects	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE PERIODIC MAINTENANCE	CODE:	8520

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8521 Bridge Bearings Realignment and Replacement</li> <li>8522 Bridge Rust Removal and Repainting</li> <li>8523 Bridge Steel Component Replacement</li> <li>8524 Bridge Inspection</li> <li>8529 Other Bridge Periodic Maintenance</li> </ul> <p>Activity 8529 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8521 to 8529.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8520 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects requiring immediate attention or as scheduled	As instructed by the Engineer	Defects requiring immediate attention or as scheduled	As instructed by the Engineer	Defects requiring immediate attention or as scheduled	As instructed by the Engineer

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE PERIODIC MAINTENANCE	CODE:	8520
<b>Activity</b>	Bridge Bearings Realignment and Replacement	Code :	8521

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged bearings or bearings out of alignment.</p> <p><b>Main Causes:</b> Wear and tear, lack of maintenance, accidents and flooding.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Potentially unsafe conditions for road users.</li> <li>• Integrity of structure threatened.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain all types of bearings to ensure that the superstructure can undergo the necessary movements without developing damaging stresses.</li> <li>• Maintain load carrying capacity.</li> </ul> <p>The activity includes all works necessary for removal and replacement of bearings and for realignment of bearings and cleaning and repairing of bearing seats if required.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Bridge bearings shall be functionally sound without defects.</li> <li>• Bearings shall be inspected in accordance with the Bridge Management System, Visual Assessment Manual (latest revision). Bearings declared as defect shall be removed and replaced within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged bearing or bearing out of alignment	As instructed by the Engineer	Damaged bearing or bearing out of alignment	As instructed by the Engineer	Damaged bearing or bearing out of alignment	As instructed by the Engineer
Other defects	As instructed by the Engineer	Other defects	As instructed by the Engineer	Other defects	As instructed by the Engineer

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE PERIODIC MAINTENANCE	CODE:	8520
<b>Activity</b>	Bridge Rust Removal and Repainting	Code :	8522

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Rusted bearings and other steel components.</p> <p><b>Main Causes:</b> Wear and tear, weather conditions, lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Potentially unsafe conditions for road users.</li> <li>• Integrity of structure threatened.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain bridge steel components to ensure they are free of rust and structurally sound.</li> <li>• Maintain load carrying capacity.</li> </ul> <p>The activity includes removal of rust from bridge components and application of approved paint in accordance with applicable SSRBW.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Bridge components shall be free of rust.</li> <li>• Rust on steel bearings and other steel components shall be removed within the response times given in the table below or as otherwise instructed following an inspection in accordance with the Bridge Management System, Visual Assessment Manual (latest revision).</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Rust on bearings and steel components	As instructed by the Engineer	Rust on bearings and steel components	As instructed by the Engineer	Rust on bearings and steel components	As instructed by the Engineer

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE PERIODIC MAINTENANCE	CODE:	8520
<b>Activity</b>	Bridge Steel Component Replacement	Code :	8523

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Worn or damaged steel components on bridges.</p> <p><b>Main Causes:</b> Wear and tear, lack of maintenance, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Potentially unsafe conditions for road users.</li> <li>• Integrity of structure threatened.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure that steel components of bridges, are kept structurally sound.</li> <li>• Ensure traffic safety.</li> <li>• Prolong the useful life of the bridge.</li> </ul> <p>The activity includes all works in connection with removal and replacement of minor steel components on bridges, excluding steel bearings. It also includes major structural components such as girders or steel decks unless explicitly specified in the Contract.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Steel bridges shall be structurally sound and free of defects that may create an unsafe condition for road users or that may jeopardise the integrity of the structure.</li> <li>• Other defects shall include but not be limited to: missing, loose or broken fasteners, corroded, cracked, bent or twisted steel components, cracking or delaminating of steel components.</li> <li>• Steel components shall be replaced within the response times given in the table below, or as otherwise directed following inspection in accordance with the Bridge Management System, Visual Assessment Manual (latest version).</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Steel components deteriorated or damaged to a condition that constitutes or has the potential to create an unsafe condition for the road users or the bridge	Without delay	Steel components deteriorated or damaged to a condition that constitutes or has the potential to create an unsafe condition for the road users or the bridge	Without delay	Steel components deteriorated or damaged to a condition that constitutes or has the potential to create an unsafe condition for the road users or the bridge	Without delay
Other defects	As instructed by the Engineer	Other defects	As instructed by the Engineer	Other defects	As instructed by the Engineer



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	BRIDGE PERIODIC MAINTENANCE	CODE:	8520
<b>Activity</b>	Bridge Inspection	Code :	8524

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> N/A</p> <p><b>Main Causes:</b> N/A</p> <p><b>Effects:</b> N/A</p>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure traffic safety.</li> <li>• Prolong the useful life of the bridge.</li> </ul> <p>The activity includes all works in connection with bridge inspection as described in the Bridge Management System, Visual Assessment Manual (latest version).</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Bridge inspections shall be carried out as scheduled in the table below and in accordance with the Bridge Management System, Visual Assessment Manual (latest version).</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Bridge Inspection not carried out as scheduled	Without delay	Bridge Inspection not carried out as scheduled	Without delay	Bridge Inspection not carried out as scheduled	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	WATERWAY MAINTENANCE AND REPAIR	CODE:	8530

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8531 Waterway Debris and Obstacles Removal</li> <li>8532 Waterway Erosion Repair</li> <li>8533 Waterway Desilting</li> <li>8539 Other Waterway Maintenance and Repair</li> </ul> <p>Activity 8539 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8531 to 8539.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8530 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Debris or obstacles affecting free flow of water	1 w	Debris or obstacles affecting free flow of water	2 w	Debris or obstacles affecting free flow of water	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	WATERWAY MAINTENANCE AND REPAIR	CODE:	8530
<b>Activity</b>	Waterway Debris and Obstacles Removal	Code :	8531

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Debris and obstacles in waterway.</p> <p><b>Main Causes:</b> Lack of maintenance, weather conditions.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Obstructions that lead to overtopping of water over the bridge may endanger the structural stability.</li> <li>• Erosion around abutments and piers.</li> <li>• Integrity of structure threatened.</li> <li>• Water may damage road embankment.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Remove debris and obstacles.</li> <li>• Ensure free flow of water.</li> <li>• Prevent damage to the sub-structure.</li> <li>• Keep design clearance under the bridge.</li> <li>• Prolong the useful life of the bridge.</li> </ul> <p>The activity includes all clearing of debris and obstacles at piers and abutments or at any point in the waterway under the bridge and at least 100 m upstream.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The waterway at least 100 m upstream and 50 m downstream and under bridges must be free of debris, silt or obstacles to allow free flow of water. (Obstacles are defined as any object or material occurring in the waterway which interfere with the flow of water and necessitates immediate removal. Such obstacles include but are not limited to: fallen trees or branches, rock fall or loose aggregate).</li> <li>• Design clearance under the bridge shall be kept.</li> <li>• Debris and obstacles shall be removed within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Debris affecting free flow of water	1 w	Bridge Inspection Debris affecting free flow of water	2 w	Debris affecting free flow of water	3 w
Obstacles affecting free flow of water	1 w	Obstacles affecting free flow of water	2 w	Obstacles affecting free flow of water	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	WATERWAY MAINTENANCE AND REPAIR	CODE:	8530
<b>Activity</b>	Waterway Erosion Repair	Code :	8532

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Erosion damage around waterway structures.</p> <p><b>Main Causes:</b> Lack of maintenance, accumulation of debris and obstacles, weather conditions, severe flooding.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Erosion around abutments and piers.</li> <li>• Integrity of structure threatened.</li> <li>• Damage to road embankment.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Prevent further damage.</li> <li>• Repair eroded portions of waterway.</li> <li>• Protect substructure from being undermined.</li> <li>• Prolong the useful life of the waterway structure.</li> </ul> <p>The activity includes all work necessary to repair eroded portions of the waterway and protect substructures from being undermined.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The waterway at least 100 m upstream and 50 m downstream, and under bridges must be free of debris, silt or obstacles to allow free flow of water.</li> <li>• Design clearance under the bridge shall be kept.</li> <li>• Waterway erosion shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Severe erosion or damage to erosion prevention structure that threatens integrity of structure	Without delay	Severe erosion or damage to erosion prevention structure that threatens integrity of structure	Without delay	Severe erosion or damage to erosion prevention structure that threatens integrity of structure	Without delay
Erosion prevention structures damaged	1 w	Erosion prevention structures damaged	2 w	Erosion prevention structures damaged	3 w
Erosion damage around structures	1 w	Erosion damage around structures	2 w	Erosion damage around structures	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	BRIDGES	CODE:	8500
<b>INTERVENTION</b>	WATERWAY MAINTENANCE AND REPAIR	CODE:	8530
<b>Activity</b>	Waterway Desilting	Code :	8533

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Accumulation of silt and sand in waterway.</p> <p><b>Main Causes:</b> Lack of maintenance, weather conditions.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Accumulations of silt or sand in waterway that lead to overtopping of water over the bridge may endanger the structural stability.</li> <li>• Erosion around abutments and piers.</li> <li>• Water may damage road embankment.</li> <li>• Integrity of structure threatened.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Remove accumulation of silt and sand from waterway.</li> <li>• Ensure free flow of water in waterway.</li> <li>• Keep design clearance under the bridge.</li> <li>• Prolong the useful life of the bridge.</li> </ul> <p>The activity includes all work required to carry out desilting operations of the waterway under the bridge and at least 100 m upstream and 50 m downstream.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The waterway at least 100 m upstream and 50 m downstream, and under bridges must be free of accumulations of silt or sand to allow free flow of water.</li> <li>• Design clearance under the bridge shall be kept.</li> <li>• Accumulations of silt or sand in waterway shall be cleared within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Waterway silted up in the opinion of the Engineer	1 w	Waterway silted up in the opinion of the Engineer	2 w	Waterway silted up in the opinion of the Engineer	3 w

## Maintenance Standards for Road and Bridge Works

### 8600 MISCELLANEOUS STRUCTURES

#### 8601 Scope

Feature 8600 Miscellaneous Structures covers routine maintenance interventions and activities to keep miscellaneous structures and associated elements, such as marker posts, stone pitching and retaining walls functional and in good repair.

The feature "Miscellaneous Structures" covers drifts, causeways and ferry landings of all kinds, including vented types, retaining walls, railway crossings, veterinary dips and subways maintenance.

Feature 8600 Miscellaneous Structures covers the following interventions and activities:

#### 8610 Drift, Causeway and Ferry Landing Maintenance

- 8611 Drift, Causeway and Ferry Landing Structure Damage Repair
- 8612 Waterway Cleaning and Clearing
- 8613 Unlined Drift Reshaping
- 8614 Marker/Guide Post Reinstatement/Replacement
- 8615 Marker/Guide Post Repainting
- 8616 Marker/Guide Post Reflector Replacement
- 8617 Grouted Stone Pitching Repair
- 8619 Other Drift, Causeway and Ferry Landing Maintenance

#### 8620 Retaining Wall Maintenance

- 8621 Retaining Wall Minor Repairs
- 8622 Retaining Wall Weep Holes Cleaning
- 8623 Retaining Wall Vegetation Clearing
- 8629 Other Retaining Wall Maintenance

#### 8630 Railway Crossing Maintenance

- 8631 Railway Crossing General Repair
- 8639 Other Railway Crossing Maintenance

#### 8640 Veterinary Dip Maintenance

- 8641 Veterinary Dip General Repair
- 8649 Other Veterinary Dip Maintenance

#### 8650 Subway Maintenance

- 8651 Subway General Repair
- 8659 Other Subway Maintenance

#### 8660 Weighbridge Area Maintenance

- 8661 Weighbridge Area General Repair
- 8669 Other Weighbridge Area Maintenance

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	DRIFT, CAUSEWAY AND FERRY LANDING MAINTENANCE	CODE:	8610

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8611 Drift, Causeway and Ferry Landing Structure Damage Repair</li> <li>8612 Waterway Cleaning and Clearing</li> <li>8613 Unlined Drift Reshaping</li> <li>8614 Marker/Guide Post Reinstatement/Replacement</li> <li>8615 Marker/Guide Post Repainting</li> <li>8616 Marker/Guide Post Reflector Replacement</li> <li>8617 Grouted Stone Pitching Repair</li> <li>8619 Other Drift, Causeway and Ferry Landing Maintenance</li> </ul> <p>Activity 8619 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8611 to 8619.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8610 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	DRIFT, CAUSEWAY AND FERRY LANDING MAINTENANCE	CODE:	8610
<b>Activity</b>	Drift, Causeway and Ferry Landing Structure Damage Repair	Code :	8611

<b>Defects, Main Causes and Effects</b>					
<ul style="list-style-type: none"> <li>• <b>Defects:</b> Damage on drifts, causeways and ferry landings structures.</li> <li>• <b>Main Causes:</b> Damages caused by vehicles, lack of maintenance, weather conditions.</li> <li>• <b>Effects:</b> <ul style="list-style-type: none"> <li>• Integrity of structure threatened.</li> <li>• Traffic hazard.</li> </ul> </li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Keep the drift, causeway or ferry landings functional and in good repair.</li> <li>• Ensure unimpeded flow of water over or through the structure without causing damage to the structure or the roadway.</li> </ul> <p>The activity includes repair on drifts, causeways and ferry landing structures.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All drifts, causeways and ferry landings shall generally be fully functional and in good repair.</li> <li>• Defects include but shall not be limited to: spalling, cracking, bent, broken, twisted, delaminated, damaged or missing components and loose fasteners.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects threaten- ing the safety of the road users	Without delay	Defects threaten- ing the safety of the road users	Without delay	Defects threaten- ing the safety of the road users	Without delay
Defects jeopardising the functionality of the structure	1 w	Defects jeopardising the functionality of the structure	2 w	Defects jeopardising the functionality of the structure	2 w
Other defects	2 w		3 w		4 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	DRIFT, CAUSEWAY AND FERRY LANDING MAINTENANCE	CODE:	8610
<b>Activity</b>	Waterway Cleaning and Clearing	Code :	8612

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Debris, obstacles and silt on drifts, causeways or ferry landings structures.</p> <p><b>Main Causes:</b> Flooding, lack of maintenance, weather conditions.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard.</li> <li>• Impeding free flow of water.</li> <li>• Integrity of structure threatened.</li> <li>• Damage to adjoining road.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Keep the drift, causeway or ferry landing functional and free of debris, obstacles and silt.</li> <li>• Ensure unimpeded flow of water over or through the structure without causing damage to the structure or the roadway and provide a smooth flow of water for at least for 100 m upstream and 50 m downstream.</li> <li>• Avoid major erosion damage in the waterway or embankments.</li> </ul> <p>The activity includes all work necessary to remove debris, obstacles and silt from drifts, causeways and ferry landings, and to provide a smooth flow of water. It includes vented drifts and causeways.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All waterways at drifts, causeways and ferry landings shall generally be fully functional and free of debris, obstacles and silt.</li> <li>• Waterways shall be cleaned and cleared within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects threatening the safety of the road users.	Without delay	Defects threatening the safety of the road users.	Without delay	Defects threatening the safety of the road users.	Without delay
Defects jeopardising the functionality of the waterway	1 w	Defects jeopardising the functionality of the waterway	2 w	Defects jeopardising the functionality of the waterway.	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	DRIFT, CAUSEWAY AND FERRY LANDING MAINTENANCE	CODE:	8610
<b>Activity</b>	Unlined Drift Reshaping	Code :	8613

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Deformed surface on earth/gravel surface of drifts.</p> <p><b>Main Causes:</b> Damages caused by heavy vehicle loads, lack of maintenance, weather conditions, unsuitable material.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Traffic hazard.</li> <li>• Poor riding quality.</li> <li>• Integrity of structure threatened.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure passage of vehicles and reasonable driving conditions.</li> <li>• Keep the drift functional and in good repair.</li> <li>• Avoid major erosion damage in the waterway.</li> </ul> <p>The activity includes all work to restore the shape of earth and gravel drift surfaces by returning material from the sides into surface depressions, and if required, adding new material from borrow areas in order to restore a uniform running surface with a gentle slope in the direction of water flow.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All drifts shall generally be fully functional and in good repair.</li> <li>• Reshaping of unlined drifts shall be carried out within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects threatening the safety of the road users	Without delay	Defects threatening the safety of the road users	Without delay	Defects threatening the safety of the road users	Without delay
Defects jeopardising the functionality of the drift	1 w	Defects jeopardising the functionality of the drift	2 w	Defects jeopardising the functionality of the drift	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	DRIFT, CAUSEWAY AND FERRY LANDING MAINTENANCE	CODE:	8610
<b>Activity</b>	Marker/Guide Post Reinstatement/Replacement	Code :	8614

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or missing marker posts on drifts, causeways and ferry landings.</p> <p><b>Main Causes:</b> Damaged by weather effects or damaged by traffic, vandalism or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Difficult driving conditions, especially at night and under low visibility.</li> <li>• Traffic safety reduced.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance optical guidance for the driver of a vehicle.</li> <li>• Assist the driver in perceiving the geometrics of the drift, causeway and ferry landing.</li> <li>• Assist in identification of drift, causeway and ferry landings locations.</li> </ul> <p>The activity includes all work required to reinstate damaged or replace missing marker posts or guide posts used on drifts, causeways and ferry landings.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The tops of posts shall not be out of alignment with the general line of posts by more than 75 mm, and posts shall not be out of plumb by more than 75 mm.</li> <li>• All marker and guide posts shall be sound and solidly set in the ground.</li> <li>• Other defects include but are not limited to: paint missing or faded, posts out of alignment or out of plumb.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged or missing marker and guide posts	Without delay	Damaged or missing marker and guide posts	Without delay	Damaged or missing marker and guide posts	Without delay
Other defects	2 w	Other defects	2 w	Other defects	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	DRIFT, CAUSEWAY AND FERRY LANDING MAINTENANCE	CODE:	8610
<b>Activity</b>	Marker/Guide Post Repainting	Code :	8615

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Paint worn out on marker and guide post on drifts, causeways and ferry landings.</p> <p><b>Main Causes:</b> Worn by weather or damaged by traffic, vandalism or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Difficult driving conditions, especially at night and under low visibility.</li> <li>• Traffic safety reduced.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance optical guidance for the driver of a vehicle.</li> <li>• Assist the driver in perceiving the geometrics of the drift, causeway and ferry landing when driving under low visibility.</li> <li>• Assist in identification of drifts, causeways and ferry landings.</li> </ul> <p>The activity includes all work required to repaint marker posts or guide posts used on drifts, causeways or ferry landings.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Painted posts shall be repainted when P % of the paint is missing, faded or worn out.</li> <li>• Marker and guide posts shall be repainted within the response times given in the table below. For Marker/Guide Post Repainting the response time shall be until actual repainting operations start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
P = 20	1 w	P = 20	2 w	P = 20	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	DRIFT, CAUSEWAY AND FERRY LANDING MAINTENANCE	CODE:	8610
<b>Activity</b>	Marker/Guide Post Reflector Replacement	Code :	8616

### Defects, Main Causes and Effects

**Defects:** Reflectors worn out or missing on marker/guide posts on drifts, causeways and ferry landings.

**Main Causes:** Worn by weather or damaged by traffic, vandalism and lack of maintenance.

**Effects:**

- Difficult driving conditions, especially at night and under poor visibility.
- Traffic safety reduced.

### Purpose and Description

The purpose of this activity is to:

- Enhance optical guidance for the driver of a vehicle.
- Assist the driver in perceiving the geometrics of the drifts, causeways and ferry landings when driving under low visibility.
- Assist in identification of drifts, causeways and ferry landings.

The activity includes all work required to replace reflectors on marker posts or guide posts used on drifts, causeways or ferry landings.

### Service Quality Standard

- Reflectors on marker posts and guide posts shall be visible from a distance of at least L m when travelling in complete darkness and with normal headlights on.
- Reflective strips shall be in clean and in good condition.
- Defects shall be repaired for the threshold levels and within the response times given in the tables below:

### Threshold Level – Response Time

Service Level A		Service Level B		Service Level C	
Threshold Level	Response Time	Threshold Level	Response Time	Threshold Level	Response Time
L = 150	1 w	L = 150	1 w	L = 150	1 w

### Defect – Response Time

Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
Missing or worn out/damaged reflectors	Without delay	Missing or worn out/damaged reflectors	Without delay	Missing or worn out/damaged reflectors	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	DRIFT, CAUSEWAY AND FERRY LANDING MAINTENANCE	CODE:	8610
<b>Activity</b>	Grouted Stone Pitching Repair	Code :	8617

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damage on drifts and causeways stone pitching and masonry works.</p> <p><b>Main Causes:</b> Inferior material, worn by weather action, lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Integrity of structure threatened.</li> <li>• Traffic safety reduced.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Keep the stone pitching and masonry work for drifts, causeways and ferry landings functional and in good repair.</li> <li>• Ensure unimpeded flow of water over or through the structure without causing damage to the structure and the roadway.</li> <li>• Avoid major erosion damage in the waterway.</li> </ul> <p>The activity includes minor repair and maintenance of masonry works and stone pitching on drifts, causeways and ferry landings.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All drifts, causeways and ferry landings shall generally be fully functional and in good repair.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects threatening the safety of the road users	Without delay	Defects threatening the safety of the road users	Without delay	Defects threatening the safety of the road users	Without delay
Defects jeopardising the functionality of the structure	2 w	Defects jeopardising the functionality of the structure	3 w	Defects jeopardising the functionality of the structure	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	RETAINING WALL MAINTENANCE	CODE:	8620

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8621 Retaining Wall Minor Repairs</li> <li>8622 Retaining Wall Weep Holes Cleaning</li> <li>8623 Retaining Wall Vegetation Clearing</li> <li>8629 Other Retaining Wall Maintenance</li> </ul> <p>Activity 8629 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8621 to 8629.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8620 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	RETAINING WALL MAINTENANCE	CODE:	8620
<b>Activity</b>	Retaining Wall Minor Repairs	Code :	8621

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damage on retaining walls.</p> <p><b>Main Causes:</b> Inferior material, damage by weather action, poor workmanship or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Integrity of structure threatened.</li> <li>• Risk of slope failure.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Keep retaining walls functional and in good repair.</li> <li>• Stabilise slopes in cuts or fills.</li> </ul> <p>The activity includes all works to carry out minor repairs to retaining walls to ensure stable retention of all backfill.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Retaining walls shall be functional and in good repair.</li> <li>• Defects include but shall not be limited to: cracking, spalling, scaling, delaminating, leaking or damaged seal in expansion joints.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects threatening the safety of the road users	Without delay	Defects threatening the safety of the road users	Without delay	Defects threatening the safety of the road users	Without delay
Defects jeopardising the functionality of the structure	2 w	Defects jeopardising the functionality of the structure	3 w	Defects jeopardising the functionality of the structure	4 w
Other defects	2 w	Other defects	3 w	Other defects	4 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	RETAINING WALL MAINTENANCE	CODE:	8620
<b>Activity</b>	Retaining Wall Weep Holes Cleaning	Code :	8622

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Clogged weep holes in retaining walls.</p> <p><b>Main Causes:</b> Weather action, lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Integrity of structure threatened.</li> <li>• Water trapped behind retaining wall.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure stable retention of all backfill.</li> <li>• Keep retaining walls in good repair.</li> <li>• Ensure adequate drainage of water from behind the retaining wall.</li> <li>• Reduce active earth pressure on retaining walls.</li> </ul> <p>The activity includes all works to carry out cleaning of weep holes in retaining walls.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Retaining walls shall generally be fully functional and in good repair.</li> <li>• Weep holes shall be open.</li> <li>• Retaining wall weep holes shall be cleaned within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects threatening the safety of the road users	Without delay	Defects threatening the safety of the road users	Without delay	Defects threatening the safety of the road users	Without delay
Defects jeopardising the functionality of the structure	2 w	Defects jeopardising the functionality of the structure	3 w	Defects jeopardising the functionality of the structure	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	RETAINING WALL MAINTENANCE	CODE:	8620
<b>Activity</b>	Retaining Wall Vegetation Clearing	Code :	8623

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Accumulation of undesired vegetation around retaining wall.</p> <p><b>Main Causes:</b> Lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Integrity of structure threatened.</li> <li>• Untidy appearance.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure stable retention of all backfill.</li> <li>• Keep retaining walls in good repair.</li> </ul> <p>The activity includes all works to clear undesired vegetation above and around retaining walls.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Retaining walls shall be fully functional and in good repair.</li> <li>• There shall be no undesired vegetation above and around the structure.</li> <li>• Vegetation shall be cleared within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Accumulation of undesired vegetation	2 w	Accumulation of undesired vegetation	3 w	Accumulation of undesired vegetation	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	RAILWAY CROSSING MAINTENANCE	CODE:	8630

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <p style="margin-left: 40px;">8631     Railway Crossing General Repair</p> <p style="margin-left: 40px;">8639     Other Railway Crossing Maintenance</p> <p>Activity 8639 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8631 to 8639.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8630 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	RAILWAY CROSSING MAINTENANCE	CODE:	8630
<b>Activity</b>	Railway Crossing General Repair	Code :	8631

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Unwanted vegetation, eroded or damaged road surface.</p> <p><b>Main Causes:</b> Lack of maintenance, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Integrity of structure threatened.</li> <li>• Untidy appearance.</li> <li>• Traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure that facilities at the railway crossing are functional and in good repair for safety and smooth passage of traffic over the railway tracks.</li> </ul> <p>The activity includes all works to maintain railway crossings, including liaison with Botswana Railway Authorities.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Railway crossings shall be functional and in good repair.</li> <li>• There shall be no undesired vegetation at the railway crossing.</li> <li>• Other defects include but shall not be limited to: potholes, depressions or ravelling of surface, accumulation of debris on or close to the railway crossing.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Accumulation of undesired vegetation	1 w	Accumulation of undesired vegetation	2 w	Accumulation of undesired vegetation	2 w
Other defects	1 w	Other defects	2 w	Other defects	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	VETERINARY DIP MAINTENANCE	CODE:	8640

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <p style="margin-left: 40px;">8641    Veterinary Dip General Repair</p> <p style="margin-left: 40px;">8649    Other Veterinary Dip Maintenance</p> <p>Activity 8649 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8641 to 8649.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8640 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	VETERINARY DIP MAINTENANCE	CODE:	8640
<b>Activity</b>	Veterinary Dip General Repair	Code :	8641

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Accumulation of undesired vegetation, damage to concrete elements, leakage of dip.</p> <p><b>Main Causes:</b> Damage by vehicles, inferior materials or poor workmanship, lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Integrity of structure threatened.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure fully functional facilities by maintaining cleanliness and structural integrity of concrete veterinary dip for smooth flow of vehicular and pedestrian traffic.</li> <li>• Avoid unnecessary delay of traffic.</li> </ul> <p>The activity includes all works to maintain veterinary dips in the road reserve and clear undesired vegetation around the veterinary dip.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Veterinary dips shall generally be clean and fully functional and in good repair.</li> <li>• There shall be no undesired vegetation and debris above and around the facilities.</li> <li>• Other defects include but shall not be limited to: spalling, cracking, delaminating, leaking, settlement, or scouring on veterinary dip structure.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Accumulation of undesired vegetation	1 w	Accumulation of undesired vegetation	2 w	Accumulation of undesired vegetation	3 w
Other defects	2 w	Other defects	3 w	Other defects	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	SUBWAY MAINTENANCE	CODE:	8650

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <p style="margin-left: 40px;">8651    Subway General Repair</p> <p style="margin-left: 40px;">8659    Other Subway Maintenance</p> <p>Activity 8659 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8651 to 8659.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8650 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	SUBWAY MAINTENANCE	CODE:	8650
<b>Activity</b>	Subway General Repair	Code :	8651

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Accumulation of undesired vegetation, damaged components of subway, dirt and tagging on structure.</p> <p><b>Main Causes:</b> Accidents, damage by vehicles, vandalism or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Safety of road users compromised.</li> <li>• Integrity of structure threatened.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Keep the structure functional and in good repair.</li> </ul> <p>The activity includes all works to maintain subways structures, repair damage, repainting, cleaning and clear vegetation around wing walls and abutments.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Subways shall generally be fully functional and in good repair.</li> <li>• There shall be no undesired vegetation around the subway structure.</li> <li>• Other defects include but shall not be limited to: missing or damaged electrical appliances, spalling, cracking, broken, bent, twisted, delaminated, damaged or missing components including signs, repainting, cleaning.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects compromising the safety of road users	Without delay	Defects compromising the safety of road users	Without delay	Defects compromising the safety of road users	Without delay
Accumulation of undesired vegetation	2 w	Accumulation of undesired vegetation	3 w	Accumulation of undesired vegetation	4 w
Other defects	2 w	Other defects	3 w	Other defects	4 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	WEIGHBRIDGE AREA MAINTENANCE	CODE:	8660

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <p style="margin-left: 40px;">8661    Weighbridge Area General Repair</p> <p style="margin-left: 40px;">8669    Other Weighbridge Area Maintenance</p> <p>Activity 8669 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8661 to 8669.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8660 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay	Defects jeopardising the functionality of the structure or the safety of the road users	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	MISCELLANEOUS STRUCTURES	CODE:	8600
<b>INTERVENTION</b>	WEIGHBRIDGE AREA MAINTENANCE	CODE:	8660
<b>Activity</b>	Weighbridge Area General Repair	Code :	8661

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Loose sand, silt and debris on roadway and weighbridge pit, unwanted or overgrown vegetation, eroded or damaged road surface or kerbs or kerbstones, foot path out of order, defect entrance gate or fencing, missing or worn out roadmarking, drainage not functioning (including drainage of weighbridge pit), street lights or lamps out of order, cattle grid out of order and road signs damaged or worn out.</p> <p><b>Main Causes:</b> Lack of maintenance, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Integrity of structure and weighbridge area threatened.</li> <li>• Traffic hazard.</li> <li>• Overload of road network.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure that facilities at the weighbridge area are functional and in good repair for safety and smooth passage of trucks.</li> <li>• Avoid unnecessary delay of traffic.</li> <li>• Prevent overload of the road network</li> </ul> <p>The activity includes all works to maintain the weighbridge area.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Weighbridge area shall be functional and in good repair.</li> <li>• There shall be no undesired vegetation in the weighbridge area.</li> <li>• Other defects include but shall not be limited to: potholes, depressions or ravelling of surface, street lights or lamps, lack of drainage, signs, road marking, accumulation of debris on or close to the weighbridge area, defect entrance gate, fencing, cattle grid, kerb, kerbstone or weighbridge pit.</li> <li>• Defects shall be repaired within the response times given in the table below</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
Defects jeopardising the safety of road users	Without delay	Defects jeopardising the safety of road users	Without delay	Defects jeopardising the safety of road users	Without delay
Defects jeopardising the axle load control	Without delay	Defects jeopardising the axle load control	Without delay	Defects jeopardising the axle load control	Without delay
Accumulation of undesired vegetation	1 w	Accumulation of undesired vegetation	2 w	Accumulation of undesired vegetation	2 w
Other defects	1 w	Other defects	2 w	Other defects	2 w

### 8700 ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS

#### 8701 Scope

Feature 8700 Road Furniture, Signs and Traffic Markings covers routine maintenance interventions and activities to keep elements essential for road safety clean, functional and in good repair. It covers repair and replacement if necessary of elements, such as guardrail, kerbstones or distance markers. It also covers normal routine and scheduled preventive maintenance of street lights and traffic signalling devices in urban areas. It further covers normal maintenance, repair and replacement if necessary of all types of sign, including overhead signs and traffic mirrors on sharp curves, road marking and signs painted on the road as well as replacement of reflective studs.

All signs, whether regulatory, guidance, warning or information signs, as well as traffic signalling devices, shall be in accordance with the latest version of Botswana Road Traffic Act: Chapter 69.01.

Feature 8700 Road Furniture, Signs and Traffic Markings covers the following interventions and activities:

#### 8710 Road Furniture Maintenance

- 8711 Guardrail Maintenance
- 8712 Kerbstone Maintenance
- 8713 Kerb Maintenance
- 8714 Distance Marker Maintenance
- 8715 Pedestrian Railing Maintenance
- 8716 Street Lighting Maintenance
- 8717 Traffic Signalling Devices Maintenance
- 8719 Other Road Furniture Maintenance

#### 8720 Road Signs Maintenance

- 8721 Road Sign Cleaning
- 8722 Road Sign Repainting
- 8723 Road Sign Repairs
- 8724 Road Sign Replacement
- 8729 Other Road Signs Maintenance

#### 8730 Road Marking Maintenance

- 8731 Road Marking Repainting
- 8732 Reflective Stud Maintenance
- 8739 Other Road Marking Maintenance

#### 8740 Rumble Strips and Speed Hump Maintenance

- 8741 Rumble Strips Maintenance
- 8742 Speed Hump Maintenance
- 8749 Other Rumble Strips and Speed Hump Maintenance

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD FURNITURE MAINTENANCE	CODE:	8710

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8711 Guardrail Maintenance</li> <li>8712 Kerbstone Maintenance</li> <li>8713 Kerb Maintenance</li> <li>8714 Distance Marker Maintenance</li> <li>8715 Pedestrian Railing Maintenance</li> <li>8716 Street Lighting Maintenance</li> <li>8717 Traffic Signalling Devices Maintenance</li> <li>8719 Other Road Furniture Maintenance</li> </ul> <p>Activity 8719 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8711 to 8719.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8710 shall be as shown in the table below:</p>					
<b>Defect - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Road furniture a traffic hazard or traffic signal not functioning	Without delay	Road furniture a traffic hazard or traffic signal not functioning	Without delay	Road furniture a traffic hazard or traffic signal not functioning	Without delay
Road furniture (other than traffic signal) not functional	1 w	Road furniture (other than traffic signal) not functional	2 w	Road furniture (other than traffic signal) not functional	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD FURNITURE MAINTENANCE	CODE:	8710
<b>Activity</b>	Guardrail Maintenance	Code :	8711

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Guardrail missing, bent, misaligned or rusted.</p> <p><b>Main Causes:</b> Damage caused by vehicles, termite action, rotting, inadequate workmanship or inferior material.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Safety hazard.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain the facilities so as to effectively serve as guide and protection to vehicular traffic.</li> <li>• Define sharp curves, high fills or other hazardous objects or locations.</li> <li>• Contain or redirect a vehicle that may inadvertently attempt to leave the roadway.</li> <li>• Reduce damage to road user and vehicle when accidents occur.</li> </ul> <p>The activity includes all works to keep guardrails functional and in good repair to. Includes maintenance of markings and reflectors on the guardrails. It includes removal, replacement if necessary, straightening, re-aligning, renovation and re-erection of damaged guardrails and support poles.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All guardrails shall be properly placed, complete, clean, without any significant damage and without erosion.</li> <li>• Guardrails shall not be more than 300 mm horizontally and 50 mm vertically misaligned, damaged or rusted.</li> <li>• All posts shall be sound and solidly set in the ground.</li> <li>• Damaged end sections shall be replaced.</li> <li>• Other defects include but shall not be limited to: rusted, broken, loose or bent brackets or other appliances, loose fasteners, cracked or out of plumb posts.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Defects represent a safety hazard (e.g. guardrail sticking out into the roadway or missing)	Without delay	Defects represent a safety hazard (e.g. guardrail sticking out into the roadway or missing)	Without delay	Defects represent a safety hazard (e.g. guardrail sticking out into the roadway or missing)	Without delay
Guardrails misaligned	1 w	Guardrails misaligned	2 w	Guardrails misaligned	3 w
Broken and/or loose supports	1 w	Broken and/or loose supports	2 w	Broken and/or loose supports	3 w
Other defects	1 w	Other defects	2 w	Other defects	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD FURNITURE MAINTENANCE	CODE:	8710
<b>Activity</b>	Kerbstone Maintenance	Code :	8712

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or missing kerbstones, loose or out of line.</p> <p><b>Main Causes:</b> Damage caused by vehicles, vandalism, inferior material or poor workmanship.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Safety hazard.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain its function in protecting the edge of the carriageway.</li> <li>• Enhance optical guidance for road users.</li> </ul> <p>The activity includes all works to keep kerbstones in place and in good repair, and replacement of broken kerbstones.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Kerbstones shall be unbroken and without visible defects that can impair its function. Kerbstones should be firmly embedded.</li> <li>• Defects include but shall not be limited to: broken, loose, cracked or otherwise damaged kerbstones.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Loose kerbstones in roadway representing a safety hazard	Without delay	Loose kerbstones in roadway representing a safety hazard	Without delay	Loose kerbstones in roadway representing a safety hazard	Without delay
Loose kerbstones out of line	2 w	Loose kerbstones out of line	3 w	Loose kerbstones out of line	4 w
Other defects	2 w	Other defects	3 w	Other defects	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD FURNITURE MAINTENANCE	CODE:	8710
<b>Activity</b>	Kerb Maintenance	Code :	8713

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or missing kerbs, loose or out of line.</p> <p><b>Main Causes:</b> Damage caused by vehicles, inferior material or poor workmanship.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Safety hazard.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain its function in separating vehicular traffic from pedestrians and cyclists along footpaths and cycle paths, and to separate traffic lanes or roadways (medians).</li> <li>• Enhance optical guidance for vehicle drivers.</li> <li>• Maintain its function in leading runoff water to catchpits.</li> <li>• Maintain its function in demarcating the edge of the roadway.</li> </ul> <p>The activity includes all works to repair or replace damaged kerbs. It includes minor masonry/concrete repairs and repainting of kerbs for visibility.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Kerbs shall be unbroken and without defects that can impair its function. Each kerb stone should be firmly embedded.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Loose kerbs in roadway representing a safety hazard	Without delay	Loose kerbs in roadway representing a safety hazard	Without delay	Loose kerbs in roadway representing a safety hazard	Without delay
Loose kerbs out of line	2 w	Loose kerbs out of line	3 w	Loose kerbs out of line	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD FURNITURE MAINTENANCE	CODE:	8710
<b>Activity</b>	Distance Marker Maintenance	Code :	8714

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or missing distance marker posts or distance marker plates.</p> <p><b>Main Causes:</b> Damaged or knocked down by vehicles or animals, worn by weather, vandalism or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Inconvenience to road users.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance distance guidance for the driver of a vehicle.</li> <li>• Assist in giving correct positions along the road.</li> </ul> <p>The activity includes all work required to reinstate damaged or missing distance marker posts or plates, including cleaning and repainting.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• The top of posts shall not be out of alignment with the general line of posts by more than 75 mm, and posts shall not be out of plumb by more than 75 mm.</li> <li>• All distance marker posts shall be soundly and solidly set in the ground with intact plates.</li> <li>• Other defects include but are not limited to the following: paint missing or faded, posts out of alignment or out of plumb, distance plates damaged or missing.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged or missing distance marker post and plate	Without delay	Damaged or missing distance marker post and plate	Without delay	Damaged or missing distance marker post and plate	Without delay
Other defects	1 w	Other defects	2 w	Other defects	2 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD FURNITURE MAINTENANCE	CODE:	8710
<b>Activity</b>	Pedestrian Railing Maintenance	Code :	8715

<b>Defects, Main Cause and, Effects</b>					
<p><b>Defects:</b> Damaged or misaligned railings, worn out paint.</p> <p><b>Main Causes:</b> Damaged by vehicles, worn by weather, vandalism or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Pedestrian safety reduced.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Guide and prevent pedestrians from entering the roadway and be safe within the walkway or pedestrian bridge.</li> <li>• Keep railings in good repair to prevent traffic accidents.</li> </ul> <p>The activity includes all work required to keep pedestrian railings functional and in good repair.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Pedestrian railings shall be clean and in good condition.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Pedestrian railing missing or hazardous to traffic	Without delay	Pedestrian railing missing or hazardous to traffic	Without delay	Pedestrian railing missing or hazardous to traffic	Without delay
Other defects	2 w	Other defects	3 w	Other defects	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD FURNITURE MAINTENANCE	CODE:	8710
<b>Activity</b>	Street Lighting Maintenance	Code :	8716

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or missing lamps, misaligned poles, damaged or missing pit covers.</p> <p><b>Main Causes:</b> Damaged by vehicles, worn by weather, vandalism or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Difficult driving conditions at night and under low visibility.</li> <li>• Traffic safety reduced.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance traffic safety through better visibility for road users.</li> <li>• Assist the driver in perceiving traffic signs and road geometrics.</li> <li>• Enhance security and comfort of the area.</li> </ul> <p>The activity includes all work required to carry out routine inspection, recording and reporting; routine replacement of lamps, general repair of faulty and/or damaged parts, and emergency call-outs.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All street lights shall be clean and functioning.</li> <li>• Scheduled preventive maintenance work shall be carried out within the response times specified.</li> <li>• Defects shall be repaired within the response times given in the table below.</li> <li>• Prompt and appropriate action shall be taken for all after hours (emergency) call outs.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
2 Nos. lanterns or more out of 5 consecutive not giving light	Without delay	2 Nos. lanterns or more out of 5 consecutive not giving light	3 d	2 Nos. lanterns or more out of 5 consecutive not giving light	1 w
Lantern damaged	Without delay	Lantern damaged	3 d	Lantern damaged	1 w
1 No. lantern out of 5 consecutive not giving light	1 w	1 No. lantern out of 5 consecutive not giving light	2 w	1 No. lantern out of 5 consecutive not giving light	2 w
Lantern support pole out of alignment or damaged	1 w	Lantern support pole out of alignment or damaged	2 w	Lantern support pole out of alignment or damaged	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD FURNITURE MAINTENANCE	CODE:	8710
<b>Activity</b>	Traffic Signalling Devices Maintenance	Code :	8717

<b>Defects, Main Causes and Effects</b>	
<p><b>Defects:</b> Damaged or missing lamps, damaged barrier posts, misaligned posts; damaged or missing pit covers.</p> <p><b>Main Causes:</b> Damaged barrier posts and supporting posts caused by vehicles, worn by weather, vandalism or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Difficult driving conditions at junctions, railway crossings, pedestrian crossings and at approaches to roundabouts.</li> <li>• Traffic safety reduced.</li> <li>• Unprotected traffic signalling devices.</li> <li>• Untidy appearance.</li> </ul>	
<b>Purpose and Description</b>	
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Enhance traffic safety through giving of orders, warning and information to drivers.</li> </ul> <p>The activity includes all work required to clean, repair and reinstate traffic signalling devices when required and concrete barrier posts that protect traffic lights. It includes but is not limited to such as lamps, casings, posts, electrical or electronic components and controllers.</p>	
<b>Service Quality Standard</b>	
<ul style="list-style-type: none"> <li>• All traffic lights shall be clean and functioning.</li> <li>• Scheduled preventive maintenance work shall be carried out within the response times specified.</li> <li>• Prompt and appropriate action shall be taken for all after hours (emergency) call outs.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>	

## Maintenance Standards for Road and Bridge Works

<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Traffic lights not functioning	Without delay	Traffic lights not functioning	Without delay	Traffic lights not functioning	Without delay
Damaged or missing lamps, defective pushbuttons, damaged equipment	Without delay, or as instructed by the Engineer	Damaged or missing lamps, defective pushbuttons, damaged equipment	Without delay, or as instructed by the Engineer	Damaged or missing lamps, defective pushbuttons, damaged equipment	Without delay, or as instructed by the Engineer
Scheduled preventive maintenance work	As instructed by the Engineer	Scheduled preventive maintenance work	As instructed by the Engineer	Scheduled preventive maintenance work	As instructed by the Engineer
Missing or damaged barrier post	Without delay	Missing or damaged barrier post	1 w	Missing or damaged barrier post	1 w
Barrier post out of alignment	Without delay	Barrier post out of alignment	1 w	Barrier post out of alignment	1 w
Signalling device post out of alignment	Without delay	Signalling device post out of alignment	1 w	Signalling device post out of alignment	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD SIGNS MAINTENANCE	CODE:	8720

<b>Scope</b>	
--------------	--

This maintenance intervention comprises the following maintenance activities:

- 8721 Road Sign Cleaning
- 8722 Road Sign Repainting
- 8723 Road Sign Repairs
- 8724 Road Sign Replacement
- 8729 Other Road Signs Maintenance

Activity 8729 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.

<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>	
--	--

The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8721 to 8729.

However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.

The Key Performance Indicator for Intervention 8720 shall be as shown in the table below:

Threshold Level - Response Time					
Service Level A		Service Level B		Service Level C	
Threshold Level	Response Time	Threshold Level	Response Time	Threshold Level	Response Time
Retro-reflectivity less than instructed	As instructed by the Engineer	Retro-reflectivity less than instructed	As instructed by the Engineer	Retro-reflectivity less than instructed	As instructed by the Engineer

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD SIGNS MAINTENANCE	CODE:	8720
<b>Activity</b>	Road Sign Cleaning	Code :	8721

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Illegible or obscured road signs (including street name signs), dirt/dust on sign face.</p> <p><b>Main Causes:</b> Dirty from vehicular traffic, windblown dirt, vandalism or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Inadequate traffic management.</li> <li>• Traffic safety reduced.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Assist road users in safe and orderly movement of traffic.</li> <li>• Keep road signs clean and easily readable at all times.</li> </ul> <p>The activity includes all work associated with cleaning of road signs.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All road signs and sign posts shall be kept clean and in good condition.</li> <li>• Road signs shall be cleaned within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Illegible or obscured regulatory and warning signs	2 d	Illegible or obscured regulatory and warning signs	4 d	Illegible or obscured regulatory and warning signs	1 w
Illegible or obscured or deflected direction (guide) or information signs	2 w	Illegible or obscured or deflected direction (guide) or information signs	3 w	Illegible or obscured or deflected direction (guide) or information signs	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD SIGNS MAINTENANCE	CODE:	8720
<b>Activity</b>	Road Sign Repainting	Code :	8722

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Illegible, obscured or fading road signs (including street name signs).</p> <p><b>Main Causes:</b> Ultraviolet radiation, ageing, accidental damage, poor workmanship, inappropriate materials, vandalism or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Inadequate traffic management.</li> <li>• Traffic safety reduced.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure that signs erected maintain their intended function.</li> <li>• Assist road users in safe and orderly movement of traffic.</li> <li>• Keep road signs in good condition and easily readable at all times.</li> </ul> <p>The activity includes all work associated with repainting of signs.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All road signs and sign posts, including road signs painted on road surface, shall be complete, easy readable and in good condition.</li> <li>• Guidance and information signs shall have a retro- reflectivity of at least R1 cd/lux-1 x m<sup>2</sup> at an observation angle of 0.2° and a light entry angle of -5°. Reflection shall be measured with specialised equipment.</li> <li>• Regulatory and warning signs shall have a retro- reflectivity of at least R2 cd/lux-1 x m<sup>2</sup>, at an observation angle of 0.2° and a light entry angle of -5°.</li> <li>• Road signs shall be repainted within the response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
R2 = 170	2 d	R2 = 170	4 d	R2 = 170	1 w
R1 = 80	1 w	R1 = 80	2 w	R1 = 80	3 w

## Maintenance Standards for Road and Bridge Works

Defect – Response Time					
Service Level A		Service Level B		Service Level C	
Defect	Response Time	Defect	Response Time	Defect	Response Time
All conditions that are causing a traffic hazard	Without delay	All conditions that are causing a traffic hazard	Without delay	All conditions that are causing a traffic hazard	Without delay
Illegible or obscured regulatory and warning signs	2 d	Illegible or obscured regulatory and warning signs	4 d	Illegible or obscured regulatory and warning signs	1 w
Delaminating, fading, premature material failure	1 w	Delaminating, fading, premature material failure	2 w	Delaminating, fading, premature material failure	3 w
Illegible or obscured guidance or information signs	1 w	Illegible or obscured guidance or information signs	2 w	Illegible or obscured guidance or information signs	3 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD SIGNS MAINTENANCE	CODE:	8720
<b>Activity</b>	Road Sign Repairs	Code :	8723

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged road sign and sign posts (including street name signs).</p> <p><b>Main Causes:</b> Damaged by vehicles, worn by weather, vandalized or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Inadequate traffic management.</li> <li>• Traffic safety reduced.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure that signs erected maintain their intended function.</li> <li>• Assist road users in safe and orderly movement of traffic.</li> <li>• Keep road signs and sign posts in good repair and easily readable at all times.</li> </ul> <p>The activity includes all work associated with repairs of signs and sign posts.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All road signs and sign posts shall be complete, and in good repair.</li> <li>• Defects shall be repaired within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
All conditions that are causing a traffic hazard	Without delay	All conditions that are causing a traffic hazard	Without delay	All conditions that are causing a traffic hazard	Without delay
Delaminating, fading or pre-mature material failure	1 w	Delaminating, fading or pre-mature material failure	2 w	Delaminating, fading or pre-mature material failure	3 w
Rust stains or pitting	1 w	Rust stains or pitting	2 w	Rust stains or pitting	3 w
Improper installation or configuration	1 w	Improper installation or configuration	2 w	Improper installation or configuration	3 w
Damage from accidents and natural events	1 w	Damage from accidents and natural events	2 w	Damage from accidents and natural events	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD SIGNS MAINTENANCE	CODE:	8720
<b>Activity</b>	Road Sign Replacement	Code :	8724

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or missing road sign face and road sign support (including street name signs).</p> <p><b>Main Causes:</b> Damaged by vehicles, worn by weather, vandalized or lack of maintenance.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Inadequate traffic management.</li> <li>• Traffic safety reduced.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Ensure that road signs and sign supports maintain their intended function.</li> <li>• Assist road users in the safe and orderly movement of traffic.</li> <li>• Keep road signs and sign supports in place and easily readable at all times.</li> </ul> <p>The activity includes all work associated with replacement of signs and sign supports.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All road signs and sign supports shall be in place, complete and in good condition.</li> <li>• Road signs and sign supports damaged beyond repair shall be replaced in accordance with the applicable SSRBW and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged sign or sign post beyond repair	2 d	Damaged sign or sign post beyond repair	4 d	Damaged sign or sign post beyond repair	1 w
Missing sign	2 d	Missing sign	4 d	Missing sign	1 w
Damaged sign support	2 d	Damaged sign support	4 d	Damaged sign support	1 w
Missing sign support	2 d	Missing sign support	4 d	Missing sign support	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD MARKING MAINTENANCE	CODE:	8730

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8731 Road Marking Repainting</li> <li>8732 Reflective Stud Maintenance</li> <li>8739 Other Road Marking Maintenance</li> </ul> <p>Activity 8739 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8731 to 8739.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>At least P % of all longitudinal markings shall have adequate visibility in the opinion of the Engineer.</p> <p>The Key Performance Indicator for Intervention 8730 shall be as shown in the table below:</p>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
P = 75	2 w	P = 75	3 w	P = 75	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD MARKING MAINTENANCE	CODE:	8730
<b>Activity</b>	Road Marking Repainting	Code :	8731

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Road markings obliterated, loss of reflective properties.</p> <p><b>Main Causes:</b> Worn out by weather and traffic action, surface repairs, poor materials and / or workmanship, accidental damage.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Inadequate traffic management.</li> <li>• Traffic safety reduced.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain road marking in good repair for traffic safety.</li> <li>• Assist the road users to perceive the road geometrics.</li> <li>• Guide, signal and direct the traffic.</li> <li>• Provide warning, instruction and information to the road users.</li> <li>• Assist road users in the safe and orderly movement of traffic.</li> </ul> <p>The activity includes all work associated with repainting of road marking, symbols and lettering, traffic island markings on short sections, in junctions, pedestrian crossings etc. where this has been worn out by traffic or lost its reflective property. Includes fresh marking on short sections where surface repairs have taken place.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All symbols and lettering and traffic island markings shall be clearly visible for the road users.</li> <li>• At least P % of all longitudinal markings shall have adequate visibility in the opinion of the Engineer.</li> <li>• Not more than N m shall be continuously free (worn out) of markings.</li> <li>• Road markings shall be repainted in accordance with SSRBW SECTION 5700: ROAD TRAFFIC MARKING and within the response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
P = 75	2 w	P = 65	3 w	P = 55	4 w
N = 25	2 w	N = 35	3 w	N = 45	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	ROAD MARKING MAINTENANCE	CODE:	8730
<b>Activity</b>	Reflective Stud Maintenance	Code :	8732

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or missing road studs or loss of reflective properties.</p> <p><b>Main Causes:</b> Hit by vehicle, pavement deterioration, product failure or poor workmanship.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Safety hazard.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain its function in demarcating the edges of the traffic lanes in darkness.</li> <li>• Optimize the visibility and reflectivity of road studs.</li> </ul> <p>The activity includes all works required to keep road studs in place and in good repair. It includes replacement of missing or damaged studs, and cleaning of existing studs.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• All road studs shall be in place, firmly fixed and functional.</li> <li>• Each road stud shall have adequate reflectivity in the opinion of the Engineer.</li> <li>• Not more than P% of studs damaged, non-reflective or missing per 1 km of road.</li> <li>• Not more than N consecutive numbers of damaged, non-reflective or missing road studs.</li> <li>• Defective or missing road studs shall be repaired within the response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
P = 5	1 w	P = 10	2 w	P = 15	3 w
N = 2	1 w	N = 3	2 w	N = 5	3 w

<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Missing, damaged or non-reflective road studs	1 w	Missing, damaged or non-reflective road studs	2 w	Missing, damaged or non-reflective road studs	3 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	RUMBLE STRIPS AND SPEED HUMP MAINTENANCE	CODE:	8740

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8741 Rumble Strips Maintenance</li> <li>8742 Speed Hump Maintenance</li> <li>8749 Other Rumble Strips and Speed Hump Maintenance</li> </ul> <p>Activity 8749 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8741 to 8749.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>At least P% of the original height of the rumble strip or speed hump shall remain in the opinion of the Engineer.</p> <p>The Key Performance Indicator for Intervention 8740 shall be as shown in the table below:</p>					
<b>Threshold Level - Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
P = 70	2 w	P = 70	3 w	P = 70	4 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	RUMBLE STRIPS AND SPEED HUMP MAINTENANCE	CODE:	8740
<b>Activity</b>	Rumble Strips Maintenance	Code :	8741

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or worn out rumble strips.</p> <p><b>Main Causes:</b> Wear, damaged by vehicle, asphalt deterioration, product failure.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Safety hazard.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain its function in warning motorists to slow down due to potential traffic hazard ahead.</li> </ul> <p>The activity includes all works required to keep road rumble strips in place and in good repair.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Rumble strips shall be in place and functional.</li> <li>• Original height of rumble strips shall not be reduced by more than P %.</li> <li>• At least A % of the surfaced area of the rumble strip shall be intact.</li> <li>• Defective or worn out rumble strips shall be repaired for threshold levels within the response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
P = 30	2 w	P = 30	3 w	P = 30	4 w
A = 85	2 w	A = 85	2 w	A = 85	2 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS	CODE:	8700
<b>INTERVENTION</b>	RUMBLE STRIPS AND SPEED HUMP MAINTENANCE	CODE:	8740
<b>Activity</b>	Speed Hump Maintenance	Code :	8742

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or worn out speed humps.</p> <p><b>Main Causes:</b> Wear, damaged by vehicle or product failure.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Speeding.</li> <li>• Safety hazard.</li> <li>• Untidy appearance.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Maintain its function to slow down vehicle speed.</li> </ul> <p>The activity includes all works required to keep speed humps functional and in good repair.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Speed humps shall be in place and functional.</li> <li>• Original height of speed humps made by asphalt or concrete shall not be reduced by more than P %.</li> <li>• More than N number of steel humps missing:</li> <li>• Defective or worn out speed humps shall be repaired for threshold levels within the response times given in the table below:</li> </ul>					
<b>Threshold Level – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>	<b>Threshold Level</b>	<b>Response Time</b>
P = 30	2 w	P = 30	3 w	P = 30	4 w
N = 2	2 w	N = 2	3 w	N = 2	4 w



### 8800 EMERGENCIES

#### 8801 Scope

Feature 8800 Emergencies covers interventions for Emergency Works to be carried out as called for by the Engineer or as required in terms of the contract in case of emergency situations in order to ensure safety of road users and to safeguard the road assets.

All emergency activities shall be carried out in accordance with the Standard Specifications for Road and Bridge Works (SSRBW) or as directed by the Engineer.

Emergency Works are designed to repair those damages to the roads which are caused directly by unforeseen natural or other phenomena with imponderable consequences occurring either in the area of the roads or elsewhere, but with a direct impact on the roads. "Unforeseen Natural or Other Phenomena" include, but are not necessarily restricted to, the following:

- Rain and wind of an extraordinary intensity and/or duration accepted as such for the project area by the meteorological office or with a return period of 20 years or more.
- Flooding from rivers resulting in surcharging of structures and overtopping of embankments constructed to agreed longitudinal profiles.
- Landslides or earthquakes originating outside the road corridor.
- Interruption to traffic from major obstacles on the road resulting from major accidents.
- Interruption to traffic from washouts resulting from exceptional rainfall where the amount of material displaced exceeds a volume of 100 cubic metres.
- The damage of a drainage structure or road embankment constructed to agreed reference levels due to water surcharging resulting in an interruption of road traffic.
- Damage to bridge from washouts or other serious incidents will in general be subject to separate tender and is not regarded as a maintenance activity, unless directed by the engineer. However, until that bridge contractor is in place, the maintenance contractor will, as part of the maintenance contract, be responsible for Traffic Control, Safety Measures and Notification and Construction of Diversions as described under Activities 8841 and 8842 for Culverts.

Actual quantities for Emergency Works will be specified in Work Orders, issued by the Engineer. The basis of payment for Emergency Works will be the actual quantities of work ordered and carried out, as measured and verified by the Engineer and valued at the unit rates and prices bid in the priced Bill of Quantities, where applicable, and otherwise at such unit rates and prices as may be agreed or determined by the Engineer under the provisions of the Contract.

## Maintenance Standards for Road and Bridge Works

Feature 8800 Emergencies covers the following interventions:

### **8810 Flooding and Washout Repair**

- 8811 Traffic Control, Safety Measures and Notification
- 8812 Construction of Diversions
- 8813 Excavation and Removal of Unsuitable Material
- 8814 Reinstatement of Roadway Structure
- 8819 Other Flooding and Washout Repair

### **8820 Land Slide Removal**

- 8821 Traffic Control, Safety Measures and Notification
- 8822 Construction of Diversions
- 8823 Excavation and Removal of Material from Roadway
- 8824 Reinstatement of Roadway Structure
- 8829 Other Land Slide Removal

### **8830 Major Obstacles Removal**

- 8831 Traffic Control, Safety Measures and Notification
- 8832 Construction of Diversions
- 8833 Removal of Major Obstacle
- 8834 Repair Damage to Pavement
- 8839 Other Major Obstacles Removal

### **8840 Damaged/Washed Out Culvert Replacement**

- 8841 Traffic Control, Safety Measures and Notification
- 8842 Construction of Diversions
- 8843 Removal of Existing Culvert
- 8844 Repair and Replacement of Culvert
- 8845 Excavation and Backfilling
- 8846 Reinstatement of Pavement and Embankments
- 8849 Other Damaged/Washed Out Culvert Replacement

### **8850 Damaged/Washed Out Miscellaneous Structures Replacement**

- 8851 Traffic Control, Safety Measures and Notification
- 8852 Construction of Diversions
- 8853 Removal of Existing Structure
- 8854 Repair and Replacement of Structure
- 8855 Excavation and Backfilling
- 8856 Reinstatement of Pavement and Embankments
- 8859 Other Damaged/Washed Out Miscellaneous Structures Replacement

### **8860 Repair to Damaged Utilities Within the Road Reserve**

- 8861 Traffic Control, Safety Measures and Notification
- 8862 Construction of Diversions
- 8863 Repair of Damaged Utilities Within the Road Reserve
- 8864 Reinstatement of Roadway Structure
- 8869 Other Repair to Damaged Utilities Within the Road Reserve

### **8890 Other Emergencies**

Maintenance intervention 8890 is reserved for any emergency that may be considered necessary to be executed within the road reserve, but is not covered by other interventions.

#### Procedure for Requesting Emergency Works:

If damages clearly caused by "Unforeseen Natural Phenomena" result in a reduction of service quality levels below the normal threshold values specified in the contract, the Contractor may make a formal request to the Engineer to carry out Emergency Works designed specifically to remedy those damages. If the Contractor decides to make a request for Emergency Works, he must:

- (i) immediately inform the Engineer of his intention to do so, by telephone, radio or other means,
- (ii) document the circumstances of the Force Majeure event and the damages caused, through photographs, video and other suitable means,
- (iii) prepare a written request, stating the type of works he intends to carry out, their exact location and the estimated quantities and costs, including photographic documentation. In any case, a request for Emergency Works must be made immediately after the Contractor gains knowledge of the existence of damages caused by "Unforeseen Natural Phenomena".

The Engineer, upon receipt of the request and not later than 24 hours thereafter, will evaluate the request made by the Contractor based on a site visit, and issue an order to carry out the Emergency Works. The order will specify the type of works, their estimated quantities, the remuneration to be paid to the Contractor, and the time allowed for their execution.

#### Obligations of Contractor during Emergencies and Emergency Works:

Given the fact that Emergency Works are remunerated separately, the Contractor will, during the execution of Emergency Works, continue to be responsible for assuring the normal service quality levels on all roads included in the contract. In particular, the Contractor will do everything reasonably possible in order to ensure the normal use of all the roads under contract, including the sections affected by emergencies. If road traffic has been interrupted because of an emergency, the Contractor will take the measures necessary:

- (i) to reopen the road to traffic in the shortest time possible, and
- (ii) to maintain the road open during emergency works, without being entitled to a specific compensation for those measures. This is valid specifically for trees or other objects which may have fallen on the road, damage to access ramps to bridges, erosion of embankments, collapse of slopes, traffic accidents, flooding, etc.

#### Minor Repairs Made Necessary by "Unforeseen Natural Phenomena":

If the works necessary to remedy damages caused by "Unforeseen Natural Phenomena" are below certain threshold values, as defined in MSSRBW, the Contractor will carry out those works as part of his normal obligations and without having the right to invoke the provision of the contract concerning emergencies and the remuneration of emergency works. In these cases the consent of the Engineer is not needed and the Contractor will simply carry out the works on his own initiative. He will nevertheless inform the Engineer of the damages occurred and the remedial measures taken.

## Maintenance Standards for Road and Bridge Works

The threshold values for minor repair per incident are as shown in the table below:

INTERVENTION	CODE	Incident	Unit	Quantity
FLOODING AND WASHOUT REPAIR	8810	Loss of embankment material	m <sup>3</sup>	100
LAND SLIDE REMOVAL	8820	Materials onto the road	m <sup>3</sup>	100
MAJOR OBSTACLES REMOVAL	8830	Road blocked	Number of incidents	1
DAMAGED/WASHED OUT CULVERT REPLACEMENT	8840	Road not passable	Number of culverts	1
DAMAGED/WASHED OUT MISCELLANEOUS STRUCTURES REPLACEMENT	8850	Road not passable	Number of misc. structures	1
DAMAGED UTILITIES	8860	Road not blocked	Number of utilities	1

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	FLOODING AND WASHOUT REPAIR	CODE:	8810

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8811 Traffic Control, Safety Measures and Notification</li> <li>8812 Construction of Diversions</li> <li>8813 Excavation and Removal of Unsuitable Material</li> <li>8814 Reinstatement of Roadway Structure</li> <li>8819 Other Flooding and Washout Repair</li> </ul> <p>Activity 8819 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8811 to 8819.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8810 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Severe flooding/ washouts completely closing the road	Without delay	Severe flooding/ washouts completely closing the road	Without delay	Severe flooding/ washouts completely closing the road	Without delay
Other flooding/ washouts, but road passable and safe	2 d	Other flooding/ washouts, but road passable and safe	4 d	Other flooding/ washouts, but road passable and safe	4 d

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	FLOODING AND WASHOUT REPAIR	CODE:	8810
<b>Activity</b>	Traffic Control, Safety Measures and Notification	Code :	8811

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Washouts and/or road closed due to flooding.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, unstable slopes.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and roadway structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Safeguard road users and the public from accident and injury as a result of flooding and/or washouts of the road.</li> <li>• Ensure smooth flow of traffic through emergency area or that traffic is smoothly diverted elsewhere.</li> <li>• Ensure that the road users, public and all stakeholders are aware of the occurrence of an emergency.</li> </ul> <p>The activity includes informing the Employer, the Engineer, the Police, local authorities, relevant stakeholders and the public about the occurrence of an emergency as soon as it occurs by telephone, radio and any available public media. Placing of traffic signs and/or flagmen to warn road users and direct where to pass.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Traffic Control, Safety Measures and Notification in connection with flooding and/or washouts of the road or roadway structure shall be attended to immediately as required, and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Flooding completely closing the road	Without delay	Flooding completely closing the road	Without delay	Flooding completely closing the road	Without delay
Other flooding, but road passable and safe	Without delay	Other flooding, but road passable and safe	Without delay	Other flooding, but road passable and safe	Without delay
Washouts completely closing the road	Without delay	Washouts completely closing the road	Without delay	Washouts completely closing the road	Without delay
Other washouts, but road passable and safe	Without delay	Other washouts, but road passable and safe	Without delay	Other washouts, but road passable and safe	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	FLOODING AND WASHOUT REPAIR	CODE:	8810
<b>Activity</b>	Construction of Diversions	Code :	8812

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Washouts and/or road closed due to flooding.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, unstable slopes.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and roadway structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Safeguard road users and the public from accident and injury as a result of flooded and/or washed out road or roadway structure.</li> <li>• Accommodate traffic by constructing and maintaining temporary diversions through or around the washed out area.</li> </ul> <p>The activity includes placing additional traffic signs and/or flagmen to warn road users and direct where to pass, and constructing and maintaining diversion or temporary passage in good passable condition.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Construction of Diversions ordered by the Engineer shall be attended to immediately as required, and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Flooding completely closing the road	Without delay	Flooding completely closing the road	Without delay	Flooding completely closing the road	Without delay
Other flooding, but road passable and safe	3 d	Other flooding, but road passable and safe	1 w	Other flooding, but road passable and safe	1 w
Washouts completely blocking the road	Without delay	Washouts completely blocking the road	Without delay	Washouts completely blocking the road	Without delay
Washouts, but road passable and safe	3 d	Washouts, but road passable and safe	1 w	Washouts, but road passable and safe	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	FLOODING AND WASHOUT REPAIR	CODE:	8810
<b>Activity</b>	Excavation and Removal of Unsuitable Material	Code :	8813

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Washouts and/or road closed due to flooding.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, washouts, unstable slopes.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and roadway structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Prepare the flooded and/or washed out area for reinstatement.</li> <li>• Reopen the road to traffic in the shortest possible time after the occurrence of a flood or a washout.</li> <li>• Restore attractive appearance of the roadway and surrounding areas.</li> </ul> <p>The activity includes excavation, clearing, cleaning and removal of debris, trees and unsuitable material from the roadway and surrounding areas.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Excavation and Removal of Unsuitable Material after a flood and/or a washout of the road shall be attended to immediately as required, and within the response times given in the table below. For this activity the response times shall be until the actual excavation and removal works start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Flooding completely closing the road	Without delay	Flooding completely closing the road	Without delay	Flooding completely closing the road	Without delay
Other flooding, but road passable and safe	2 d	Other flooding, but road passable and safe	4 d	Other flooding, but road passable and safe	4 d
Washouts completely closing the road	Without delay	Washouts completely closing the road	Without delay	Washouts completely closing the road	Without delay
Washouts, but road passable and safe	2 d	Washouts, but road passable and safe	4 d	Washouts, but road passable and safe	4 d



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	FLOODING AND WASHOUT REPAIR	CODE:	8810
<b>Activity</b>	Reinstatement of Roadway Structure	Code :	8814

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Washouts.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, washouts, unstable slopes..</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and roadway structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Restore road pavement structure and surfacing to original condition.</li> <li>• Prevent future damage to the road and structure.</li> <li>• Restore safe passage of traffic and drainage system in a safe and orderly manner.</li> </ul> <p>The activity includes building up the road pavement in layers to its original condition and cross-section, and constructing erosion protection works as required, in order to prevent future damage to the road and roadway structure. Restore passage of traffic and safeguard the road users in a safe and orderly manner.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Reinstatement of Roadway Structure shall be attended to immediately as required, and within the response times given in the table below. For this activity the response times shall be measured from completion of activity 8813 until the actual reinstatement works start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Washouts completely closing the road	Without delay	Washouts completely closing the road	Without delay	Washouts completely closing the road	Without delay
Washouts, but road passable and safe	2 d	Washouts, but road passable and safe	4 d	Washouts, but road passable and safe	4 d

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	LAND SLIDE REMOVAL	CODE:	8820

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8821 Traffic Control, Safety Measures and Notification</li> <li>8822 Construction of Diversions</li> <li>8823 Excavation and Removal of Material from Roadway</li> <li>8824 Reinstatement of Roadway Structure</li> <li>8829 Other Land Slide Removal</li> </ul> <p>Activity 8829 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8821 to 8829.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8820 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Land slides completely blocking the road	Without delay	Land slides completely blocking the road	Without delay	Land slides completely blocking the road	Without delay
Land slides, but road passable and safe	3 d	Land slides, but road passable and safe	1 w	Land slides, but road passable and safe	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	LAND SLIDE REMOVAL	CODE:	8820
<b>Activity</b>	Traffic Control, Safety Measures and Notification	Code :	8821

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Landslides on the road.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, unstable slopes.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and roadway structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Safeguard road users and the public from accident and injury as a result of land slides on the road.</li> <li>• Ensure smooth flow of traffic through emergency area or that traffic is smoothly diverted elsewhere.</li> <li>• Ensure that the road users, public and all stakeholders are aware of the occurrence of an emergency.</li> </ul> <p>The activity includes informing the Employer, the Engineer, the Police, local authorities, relevant stakeholders and the public about the occurrence of an emergency as soon as it occurs by telephone, radio and any available public media. Placing of traffic signs and/or flagmen to warn road users and direct where to pass.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Traffic Control, Safety Measures and Notification in connection with land slides on the road shall be attended to immediately as required, and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Land slides completely blocking the road	Without delay	Land slides completely blocking the road	Without delay	Land slides completely blocking the road	Without delay
Land slides, but road passable and safe	Without delay	Land slides, but road passable and safe	Without delay	Land slides, but road passable and safe	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	LAND SLIDE REMOVAL	CODE:	8820
<b>Activity</b>	Construction of Diversions	Code :	8822

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Landslides on the road.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, unstable slopes.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and roadway structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Safeguard road users and the public from accident and injury as a result of a land slide on the road.</li> <li>• Accommodate traffic by constructing and maintaining temporary diversions through or around the land slide area.</li> </ul> <p>The activity includes placing additional traffic signs and/or flagmen to warn road users and direct where to pass, and constructing and maintaining diversion or temporary passage in good passable condition.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Construction of Diversions ordered by the Engineer shall be attended to immediately as required, and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Land slides completely blocking the road	Without delay	Land slides completely blocking the road	Without delay	Land slides completely blocking the road	Without delay
Land slides, but road passable and safe	3 d	Land slides, but road passable and safe	1 w	Land slides, but road passable and safe	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	LAND SLIDE REMOVAL	CODE:	8820
<b>Activity</b>	Excavation and Removal of Material from Roadway	Code :	8823

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Landslides on the road.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, unstable slopes.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and roadway structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Clear the road from unwanted material in order to reopen the road to traffic in the shortest possible time after the occurrence of a land slide on the road.</li> <li>• Restore an attractive appearance of the roadway.</li> <li>• Prepare the area affected by the landslide for reinstatement.</li> </ul> <p>The activity includes excavation, clearing, cleaning and removal of soil, debris, trees and unsuitable materials from the roadway and surrounding areas.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Excavation and Removal of Material from Roadway after land slide shall be attended to immediately as required, and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Land slides completely blocking the road	Without delay	Land slides completely blocking the road	Without delay	Land slides completely blocking the road	Without delay
Land slides, but road passable and safe	3 d	Land slides, but road passable and safe	1 w	Land slides, but road passable and safe	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	LAND SLIDE REMOVAL	CODE:	8820
<b>Activity</b>	Reinstatement of Roadway Structure	Code :	8824

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Landslides on the road.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, unstable slopes.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and roadway structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Restore road pavement and surfacing to original condition.</li> <li>• Prevent future damage to road and roadway structure.</li> <li>• Restore safe passage of traffic and drainage system in a safe and orderly manner.</li> </ul> <p>The activity includes building up the road formation and pavement in layers to its original condition and cross-section. Construction of erosion protection works as required in order to prevent future damage to the road and roadway structure, and restore passage of traffic and safeguard the road users in a safe and orderly manner.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Reinstatement of Roadway Structure shall be attended to immediately as required, and within the response times given in the table below. For this activity the response times shall be measured from completion of activity 8823 until the actual reinstatement works start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Roadway structure damaged by landslide	Without delay	Roadway structure damaged by landslide	Without delay	Roadway structure damaged by landslide	Without delay
Roadway structure partly damaged by landslides.	3 d	Roadway structure partly damaged by landslides.	1 w	Roadway structure partly damaged by landslides.	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	MAJOR OBSTACLES REMOVAL	CODE:	8830

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8831 Traffic Control, Safety Measures and Notification</li> <li>8832 Construction of Diversions</li> <li>8833 Removal of Major Obstacle</li> <li>8834 Repair Damage to Pavement</li> <li>8839 Other Major Obstacles Removal</li> </ul> <p>Activity 8839 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8831 to 8839.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8830 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Major obstacle completely blocking the road	Without delay	Major obstacle completely blocking the road	Without delay	Major obstacle completely blocking the road	Without delay
Other major obstacle on road, but road passable and safe	3 d	Other major obstacle on road, but road passable and safe	1 w	Other major obstacle on road, but road passable and safe	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	MAJOR OBSTACLES REMOVAL	CODE:	8830
<b>Activity</b>	Traffic Control, Safety Measures and Notification	Code :	8831

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Major obstacle on the road; fallen trees, cargo spillage, accident vehicles, large rocks or chemical spillage.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, steep slopes, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>Blocked or partially blocked roads.</li> <li>Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>Safeguard road users and the public from accident and injury as a result of major obstacles on the road.</li> <li>Ensure smooth flow of traffic through emergency area, or that traffic is smoothly diverted elsewhere.</li> <li>Ensure that the road users, public and all stakeholders are aware of the occurrence of an emergency.</li> </ul> <p>The activity includes informing the Employer, the Engineer, the Police, local authorities, relevant stakeholders and the public about the occurrence of an emergency as soon as it occurs by telephone, radio and any available public media. Placing of traffic signs and/or flagmen to warn road users and direct where to pass.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>Traffic Control, Safety Measures and Notification in connection with major obstacles removal shall be attended to immediately as required, and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Major obstacle completely blocking the road	Without delay	Major obstacle completely blocking the road	Without delay	Major obstacle completely blocking the road	Without delay
Other major obstacle on road, but road passable and safe	Without delay	Other major obstacle on road, but road passable and safe.	Without delay	Other major obstacle on road, but road passable and safe	Without delay



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	MAJOR OBSTACLES REMOVAL	CODE:	8830
<b>Activity</b>	Construction of Diversions	Code :	8832

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Major obstacles on the road.</p> <p><b>Main Causes:</b> Accidents, severe weather conditions.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>Blocked or partially blocked roads.</li> <li>Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>Safeguard road users and the public from accident and injury as a result of major obstacle on the road.</li> <li>Accommodate traffic by constructing and maintaining temporary diversions through or around the blocked area.</li> </ul> <p>The activity includes placing additional traffic signs and/or flagmen to warn road users and direct where to pass, and if required, constructing and maintaining diversion or temporary passage in good passable condition.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>Construction of Diversions ordered by the Engineer shall be attended to immediately as required, and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Major obstacle completely blocking the road	Without delay	Major obstacle completely blocking the road	Without delay	Major obstacle completely blocking the road	Without delay
Major obstacle, but road passable and safe	3 d	Major obstacle, but road passable and safe	1w	Major obstacle, but road passable and safe	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	MAJOR OBSTACLES REMOVAL	CODE:	8830
<b>Activity</b>	Removal of Major Obstacle	Code :	8833

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Major obstacle on the road; fallen trees, cargo spillage, accident vehicles, large rocks or chemical spillage.</p> <p><b>Main Causes:</b> Severe weather conditions, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Completely or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Remove major obstacles from the roadway in order to reopen the road to traffic in the shortest possible time.</li> <li>• Restore attractive appearance of the roadway.</li> <li>• Safeguard road users.</li> </ul> <p>The activity includes removal from the roadway area of major obstacles such as large rocks, fallen trees or branches, accident vehicles and cargo spillage (including spillage of chemicals) blocking the road, and disposing at designated places in an environmentally friendly manner.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Major obstacles shall be attended to and removed immediately as required, and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Major obstacle completely blocking the road	Without delay	Major obstacle completely blocking the road	Without delay	Major obstacle completely blocking the road	Without delay
Other obstacle on road, but road passable and safe	3 d	Other obstacle on road, but road passable and safe	1w	Other obstacle on road, but road passable and safe	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	MAJOR OBSTACLES REMOVAL	CODE:	8830
<b>Activity</b>	Repair Damage to Pavement	Code :	8834

<b>Defects, Main Causes and Effects</b>					
<p><b>Defects:</b> Major obstacle on the road; fallen trees, cargo spillage, accident vehicles, large rocks or chemical spillage.</p> <p><b>Main Causes:</b> Severe weather conditions, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>Blocked or partially blocked roads.</li> <li>Damage to pavement.</li> <li>Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>Repair damaged areas of pavement to original condition.</li> <li>Restore safe passage of traffic and drainage system in a safe and orderly manner.</li> </ul> <p>The activity includes repairing the road pavement and surfacing damaged by the obstacle to their original condition and reinstating passage of traffic in a safe and orderly manner. Damages can include but are not limited to scratched surface, burnt surface, oil spillage and dented surface as a result of an obstacle.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>Repair of damaged pavement shall be attended to immediately as required, and within the response times given in the table below. For this activity the response times shall be measured from completion of activity 8833 until the actual repair works start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damage affecting pavement structure	Without delay	Damage affecting pavement structure	Without delay	Damage affecting pavement structure	Without delay
Damage affecting surfacing only	3 d	Damage affecting surfacing only	1w	Damage affecting surfacing only	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT CULVERT REPLACEMENT	CODE:	8840

<b>Scope</b>					
<p>This intervention comprises the following activities:</p> <ul style="list-style-type: none"> <li>8841 Traffic Control, Safety Measures and Notification</li> <li>8842 Construction of Diversions</li> <li>8843 Removal of Existing Culvert</li> <li>8844 Repair and Replacement of Culvert</li> <li>8845 Excavation and Backfilling</li> <li>8846 Reinstatement of Pavement and Embankments</li> <li>8849 Other Damaged/Washed Out Culvert Replacement Works</li> </ul>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8841 to 8849.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8840 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay
Culvert damaged or washed out but road passable to traffic	1 d	Culvert damaged or washed out but road passable to traffic	1 w	Culvert damaged or washed out but road passable to traffic	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT CULVERT REPLACEMENT	CODE:	8840
<b>Activity</b>	Traffic Control, Safety Measures and Notification	Code :	8841

<b>Defects , Main Causes and Effects</b>					
<p><b>Defect:</b> Damaged or washed out culverts.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Safeguard road users and the public from accident and injury as a result of major obstacles on the road.</li> <li>• Ensure smooth flow of traffic through emergency area or that traffic is smoothly diverted elsewhere.</li> <li>• Ensure that the road users, public and all stakeholders are aware of the occurrence of an emergency.</li> </ul> <p>The activity entails informing the Employer, the Engineer, the Police, local authorities, relevant stakeholders and the public about the occurrence of an emergency as soon as it occurs by telephone, radio and any available public media; placing traffic signs and/or flagmen to warn road users and direct where to pass.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Damaged or washed out culverts shall be attended to immediately as required and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay
Culvert damaged or washed out but road passable to traffic	Without delay	Culvert damaged or washed out but road passable to traffic	Without delay	Culvert damaged or washed out but road passable to traffic	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT CULVERT REPLACEMENT	CODE:	8840
<b>Activity</b>	Construction of Diversions	Code :	8842

<b>Defects , Main Causes and Effects</b>					
<p><b>Defect:</b> Damaged or washed out culverts.</p> <p><b>Main Causes:</b> Flooding, severe weather conditions.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>Blocked or partially blocked roads.</li> <li>Damage to road and structures.</li> <li>Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>Safeguard road users and the public from accident and injury as a result of a landslide on the road.</li> <li>Accommodate traffic by constructing and maintaining temporary diversions through or around the broken or washed out culvert.</li> </ul> <p>The activity entails placing additional traffic signs and/or flagmen to warn road users and direct where to pass, and constructing and maintaining diversion or temporary passage in good passable condition.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>Construction of diversions ordered by the Engineer shall be attended to immediately as required and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged/washed out culvert completely blocking the road	Without delay	Damaged/washed out culvert completely blocking the road	Without delay	Damaged/washed out culvert completely blocking the road	Without delay
Damaged/washed out culvert but road passable and safe	3 d	Damaged/washed out culvert but road passable and safe	1 w	Damaged/washed out culvert but road passable and safe	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT CULVERT REPLACEMENT	CODE:	8840
<b>Activity</b>	Removal of Existing Culvert	Code :	8843

<b>Defects , Main Causes and Effects</b>					
<p><b>Defect:</b> Damaged beyond repair or washed out culverts.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Remove damaged culvert.</li> <li>• Reopen the road to traffic in the shortest possible time after the occurrence of a broken or washed out culvert.</li> <li>• Restore safe passage of traffic and drainage system in a safe and orderly manner.</li> </ul> <p>The activity involves excavation and removal of washed out or broken culvert in order to prepare for reinstatement of it or construction of a new one.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Removal of damaged or washed out culverts shall be attended to immediately as required and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay
Culvert damaged or washed out but road passable to traffic	1 d	Culvert damaged or washed out but road passable to traffic	1 w	Culvert damaged or washed out but road passable to traffic	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT CULVERT REPLACEMENT	CODE:	8840
<b>Activity</b>	Repair and Replacement of Culvert	Code :	8844

<b>Defects , Main Causes and Effects</b>					
<p><b>Defect:</b> Damaged or washed out culverts.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Repair and replace damaged or washed out culverts in order to safeguard the road users.</li> <li>• Reopen the road to traffic in the shortest possible time after the occurrence of a broken or washed out culvert crossing.</li> <li>• Restore safe passage of traffic and drainage system in a safe and orderly manner.</li> </ul> <p>The activity involves repairing and reinstating a washed out culvert whose units have been damaged, or installing new culvert units if ordered by the Engineer.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Repair of damaged or washed out culverts shall be attended to immediately as required and within the response times given in the table below. For this activity the response time shall be measured from completion of activity 8843 until the actual repair or replacement works start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay
Culvert damaged or washed out but road passable to traffic	1 d	Culvert damaged or washed out but road passable to traffic	1 w	Culvert damaged or washed out but road passable to traffic	1w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT CULVERT REPLACEMENT	CODE:	8840
<b>Activity</b>	Excavation and Backfilling	Code :	8845

<b>Defects , Main Causes and Effects</b>					
<p><b>Defect:</b> Damaged or washed out culverts.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Excavate culvert trench and backfill in connection with repair and replacement of broken or washed out culverts.</li> <li>• Reinstate culvert crossing in order to safeguard the road users;</li> <li>• Restore safe passage of traffic and drainage system in a safe and orderly manner.</li> </ul> <p>The activity involves excavating trench for culvert and backfilling after the culvert units have been installed.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Excavation and backfilling shall be attended to immediately as required and within the response times given in the table below. For Excavation and Backfilling the response time shall be measured from order given by the Engineer until the actual excavation and backfilling works start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay
Culvert damaged or washed out but road passable to traffic	1 d	Culvert damaged or washed out but road passable to traffic	1 w	Culvert damaged or washed out but road passable to traffic	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT CULVERT REPLACEMENT	CODE:	8840
<b>Activity</b>	Reinstatement of Pavement and Embankments	Code :	8846

<b>Defects , Main Causes and Effects</b>					
<p><b>Defect:</b> Damaged or washed out culverts.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Restore embankment and road pavement and surfacing to original condition.</li> <li>• Prevent future damage to the road and structure.</li> <li>• Restore safe passage of traffic.</li> </ul> <p>The activity involves building up the road pavement in layers to its original condition and cross-section, constructing erosion protection measures in order to prevent future damage to the road and structure and reinstate passage of traffic and safeguard the road users.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Reinstatement of pavement and embankments shall be attended to immediately as required and within the response times given in the table below. For Reinstatement of Pavement and Embankments the response time shall be measured from completion of activity 8845 until the actual repair or replacement works start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay	Culvert completely damaged or washed out and road not passable to traffic	Without delay
Culvert damaged or washed out but road passable to traffic	1 d	Culvert damaged or washed out but road passable to traffic	1 w	Culvert damaged or washed out but road passable to traffic	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT MISCELLANEOUS STRUCTURES REPLACEMENT	CODE:	8850

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8851 Traffic Control, Safety Measures and Notification</li> <li>8852 Construction of Diversions</li> <li>8853 Removal of Existing Structure</li> <li>8854 Repair and Replacement of Structure</li> <li>8855 Excavation and Backfilling</li> <li>8856 Reinstatement of Pavement and Embankments</li> <li>8859 Other Damaged/Washed Out Miscellaneous Structures Replacement</li> </ul> <p>Activity 8859 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8851 to 8859.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicators for Intervention 8850 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay
Misc. structure damaged or washed out but road passable to traffic	Without delay	Misc. structure damaged or washed out but road passable to traffic	Without delay	Misc. structure damaged or washed out but road passable to traffic	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT MISCELLANEOUS STRUCTURES REPLACEMENT	CODE:	8550
<b>Activity</b>	Traffic Control, Safety Measures and Notification	Code :	8851

<b>Defects , Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or washed out structures such as drifts, causeways, ferry landings, retaining walls and erosion protection works.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Safeguard road users and the public from accident and injury as a result of broken, damaged or washed out structure.</li> <li>• Ensure smooth flow of traffic through emergency area or that traffic is smoothly diverted elsewhere.</li> <li>• Ensure that the road users, public and all stakeholders are aware of the occurrence of an emergency.</li> </ul> <p>The activity includes informing the Employer, the Engineer, the Police, local authorities, relevant stakeholders and the public about the occurrence of an emergency as soon as it occurs by telephone, radio and any available public media; placing traffic signs and/or flagmen to warn road users and direct where to pass.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Traffic Control, Safety Measures and Notification for broken, damaged or washed out structures shall be attended to immediately as required, and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay
Misc. structure damaged or washed out but road passable to traffic	Without delay	Misc. structure damaged or washed out but road passable to traffic	Without delay	Misc. structure damaged or washed out but road passable to traffic	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT MISCELLANEOUS STRUCTURES REPLACEMENT	CODE:	8550
<b>Activity</b>	Construction of Diversions	Code :	8852

<b>Defects , Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or washed out out structures such as drifts, causeways, ferry landings, retaining walls and erosion protection works.</p> <p><b>Main Causes:</b> Flooding, severe weather conditions, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>Blocked or partially blocked roads.</li> <li>Damage to road and structures.</li> <li>Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>Construction of diversion.</li> <li>Safeguard road users and the public from accident and injury as a result of broken, damaged or washed out structure.</li> <li>Accommodate traffic by constructing and maintaining temporary diversions through or around the broken, damaged or washed out structure.</li> </ul> <p>The activity includes placing additional traffic signs and/or flagmen to warn road users and direct where to pass, and constructing and maintaining diversion or temporary passage in good passable condition.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>Construction of Diversions ordered by the Engineer shall be attended to immediately as required and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged/ washed out misc. structure completely blocking the road	Without delay	Damaged/ washed out misc. structure completely blocking the road	Without delay	Damaged/ washed out misc. structure completely blocking the road	Without delay
Damaged/ washed out misc. structure, but road passable and safe	3 d	Damaged/ washed out misc. structure, but road passable and safe	1 w	Damaged/ washed out misc. structure, but road passable and safe	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT MISCELLANEOUS STRUCTURES REPLACEMENT	CODE:	8550
<b>Activity</b>	Removal of Existing Structure	Code :	8853

<b>Defects , Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or washed out out structures such as drifts, causeways, ferry landings, retaining walls and erosion protection works.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Remove damaged structure.</li> <li>• Reopen the road to traffic in the shortest possible time after the occurrence of a broken or washed out structure.</li> <li>• Restore safe passage of traffic and drainage system in a safe and orderly manner.</li> </ul> <p>The activity includes excavation and removal of washed out or broken miscellaneous structure in order to prepare for reinstatement of it or construction of a new one.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Removal of Existing Structure shall be attended to immediately as required and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay
Misc. structure damaged or washed out but road passable to traffic	1 d	Misc. structure damaged or washed out but road passable to traffic	1 w	Misc. structure damaged or washed out but road passable to traffic	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT MISCELLANEOUS STRUCTURES REPLACEMENT	CODE:	8550
<b>Activity</b>	Repair and Replacement of Structure	Code :	8854

<b>Defects , Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or washed out structures such as drifts, causeways, ferry landings, retaining walls and erosion protection works.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Repair or replace damaged or washed out structure.</li> <li>• Reopen the road to traffic in the shortest possible time after the occurrence of a broken or washed structure.</li> <li>• Restore safe passage of traffic and drainage system in a safe and orderly manner.</li> </ul> <p>The activity includes repairing and reinstating a washed out structure whose units have not been damaged, or installing new units if ordered by the Engineer.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Repair and replacement of damaged or washed out structure shall be attended to immediately as required and within the response times given in the table below. For this activity the response time shall be measured from completion of activity 8853 until the actual replacement works start. or from temporary traffic diversion is established for repair.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay
Misc. structure partly damaged or washed out but road not passable to traffic	Without delay	Misc. structure partly damaged or washed out but road not passable to traffic	Without delay	Misc. structure partly damaged or washed out but road not passable to traffic	Without delay
Misc. structure damaged or washed out but road passable to traffic	1 d	Misc. structure damaged or washed out but road passable to traffic	1 w	Misc. structure damaged or washed out but road passable to traffic	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT MISCELLANEOUS STRUCTURES REPLACEMENT	CODE:	8550
<b>Activity</b>	Excavation and Backfilling	Code :	8855

<b>Defects , Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or washed out out structures such as drifts, causeways, ferry landings, retaining walls and erosion protection works.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Excavation and backfill in connection with repair and replacement of damaged or washed out structure..</li> <li>• Reinstate structure in order to safeguard the road users;</li> <li>• Restore safe passage of traffic and drainage system where required, in a safe and orderly manner.</li> </ul> <p>The activity includes excavation and backfilling after the structure units have been repaired or replaced.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Excavation and Backfilling shall be attended to immediately as required and within the response times given in the table below. For Excavation and Backfilling the response times shall be measured from order given by the Engineer until the actual excavation and backfilling works start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay
Misc. structure damaged or washed out but road passable to traffic	1 d	Misc. structure damaged or washed out but road passable to traffic	1 w	Misc. structure damaged or washed out but road passable to traffic	1 w



## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	DAMAGED/WASHED OUT MISCELLANEOUS STRUCTURES REPLACEMENT	CODE:	8550
<b>Activity</b>	Reinstatement of Pavement and Embankments	Code :	8856

<b>Defects , Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged or washed out out structures such as drifts, causeways, ferry landings, retaining walls and erosion protection works.</p> <p><b>Main Causes:</b> Severe weather conditions, floods, accidents.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Damage to road and structures.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of traffic and traffic hazard.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Restore embankment and road pavement and surfacing to original condition.</li> <li>• Prevent future damage to the road and structure.</li> <li>• Restore safe passage of traffic.</li> </ul> <p>The activity includes building up the road pavement in layers to its original condition and cross-section; constructing erosion protection measures in order to prevent future damage to the road and structure and reinstate passage of traffic and safeguard the road users.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Reinstatement of Pavement and Embankments shall be attended to immediately as required and within the response times given in the table below. For Reinstatement of Pavement and Embankments the response times shall be measured from completion of activity 8855 until the actual repair or replacement works start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay	Misc. structure completely damaged or washed out and road not passable to traffic	Without delay
Misc. structure damaged or washed out but road passable to traffic	1 d	Misc. structure damaged or washed out but road passable to traffic	1 w	Misc. structure damaged or washed out but road passable to traffic	1 w

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	REPAIR TO DAMAGED UTILITIES WITHIN THE ROAD RESERVE	CODE:	8860

<b>Scope</b>					
<p>This maintenance intervention comprises the following maintenance activities:</p> <ul style="list-style-type: none"> <li>8861 Traffic Control, Safety Measures and Notification</li> <li>8862 Construction of Diversions</li> <li>8863 Repair of Damaged Utilities Within the Road Reserve</li> <li>8864 Reinstatement of Roadway Structure</li> <li>8869 Other Repair to Damaged Utilities Within the Road Reserve</li> </ul> <p>Activity 8869 is reserved for any new activity that may be considered necessary to be executed within the above intervention but is not covered by other activities in the intervention.</p>					
<b>Service Quality Standard/ Key Performance Indicator(s) (KPI(s))</b>					
<p>The Service Quality Standard for this intervention shall normally be controlled in accordance with the threshold levels and response times given for each of the Activities 8861 to 8869.</p> <p>However, in certain cases the Engineer may opt to select one or more Key Performance Indicators to represent the performance of the whole intervention. The Engineer may then verify that the required Service Levels have been complied with through monitoring of the KPI(s), without having to monitor the performance of all activities.</p> <p>The Key Performance Indicator for Intervention 8860 shall be as shown in the table below:</p>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged utility within road reserve being a hazard	Without delay	Damaged utility within road reserve being a hazard	Without delay	Damaged utility within road reserve being a hazard	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	REPAIR TO DAMAGED UTILITIES WITHIN THE ROAD RESERVE	CODE:	8860
<b>Activity</b>	Traffic Control, Safety Measures and Notification	Code :	8861

<b>Defects , Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged utility within the road reserve.</p> <p><b>Main Causes:</b> Severe weather conditions, lightning, floods, accidents, excessive pressure, vandalism.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Disruption of traffic and traffic hazard.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of public utility service.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Safeguard road users and the public from accident and injury as a result of damage to utilities within the road reserve.</li> <li>• Ensure smooth flow of traffic through emergency area or that traffic is smoothly diverted elsewhere.</li> <li>• Ensure that the road users, public and all stakeholders are aware of the occurrence of an emergency.</li> </ul> <p>The activity includes informing the Employer, the Engineer, the Police, local authorities, relevant utility provider and the public about the occurrence of an emergency as soon as it occurs by telephone, radio and any available public media; placing traffic signs and/or flagmen to warn road users and direct where to pass.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Damaged utility within the road reserve shall be attended to as required and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged utility within road reserve being a hazard	Without delay	Damaged utility within road reserve being a hazard	Without delay	Damaged utility within road reserve being a hazard	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	REPAIR TO DAMAGED UTILITIES WITHIN THE ROAD RESERVE	CODE:	8860
<b>Activity</b>	Construction of Diversions	Code :	8862

<b>Defects , Main Causes and Effects</b>					
<p><b>Defects:</b> Damaged utility within the road reserve.</p> <p><b>Main Causes:</b> Severe weather conditions, lightning, floods, accidents, excessive pressure, vandalism.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Disruption of traffic and traffic hazard.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of public utility service.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Safeguard road users and the public from accident and injury as a result of damaged utility within the road reserve.</li> <li>• Accommodate traffic by constructing and maintaining temporary diversions through or around the damaged utility.</li> </ul> <p>The activity includes placing additional traffic signs and/or flagmen to warn road users and direct where to pass, and constructing and maintaining diversion or temporary passage in good passable condition.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Construction of diversions ordered by the Engineer shall be attended to as required and within the response times given in the table below:</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged utility within road reserve being a hazard	Without delay	Damaged utility within road reserve being a hazard	Without delay	Damaged utility within road reserve being a hazard	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	REPAIR TO DAMAGED UTILITIES WITHIN THE ROAD RESERVE	CODE:	8860
<b>Activity</b>	Repair of Damaged Utilities Within the Road Reserve	Code :	8863

<b>Defects , Main Causes and Effects</b>					
<p><b>Defects:</b> Damage to utility within the road reserve.</p> <p><b>Main Causes:</b> Severe weather conditions, lightning, floods, accidents, excessive pressure, vandalism.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Disruption of traffic and traffic hazard.</li> <li>• Blocked or partially blocked roads.</li> <li>• Disruption of public utility service.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Assist the relevant utility provider to carry out repair of the damaged utility.</li> <li>• Carry out repair and replacement of utility where allowed by the utility provider.</li> <li>• Reopen the road to traffic in the shortest possible time after the occurrence of damaged utility.</li> <li>• Restore safe passage of traffic in a safe and orderly manner.</li> </ul> <p>The activity includes assisting the utility provider in repairing damaged utility, or repairing and reinstating the relevant utility, if allowed by the utility provider.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• When repairing and replacing utilities, the requirements of the service provider shall be met.</li> <li>• Repair and replacement of damaged utility within the road reserve shall be attended to as required and within the response times given in the table below.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged utility within road reserve being a hazard	Without delay	Damaged utility within road reserve being a hazard	Without delay	Damaged utility within road reserve being a hazard	Without delay

## Maintenance Standards for Road and Bridge Works

<b>FEATURE</b>	EMERGENCIES	CODE:	8800
<b>INTERVENTION</b>	REPAIR TO DAMAGED UTILITIES WITHIN THE ROAD RESERVE	CODE:	8860
<b>Activity</b>	Reinstatement of Roadway Structure	Code :	8864

<b>Defects , Main Causes and Effects</b>					
<p><b>Defects:</b> Damage to roadway structure due to damage from a utility.</p> <p><b>Main Causes:</b> Severe weather conditions, lightning, floods, accidents, excessive pressure, vandalism.</p> <p><b>Effects:</b></p> <ul style="list-style-type: none"> <li>• Disruption of traffic and traffic hazard.</li> <li>• Blocked or partially blocked roads.</li> </ul>					
<b>Purpose and Description</b>					
<p>The purpose of this activity is to:</p> <ul style="list-style-type: none"> <li>• Restore road embankment, road pavement and surfacing to original condition.</li> <li>• Prevent future damage to the road pavement and structure.</li> <li>• Restore safe passage of traffic.</li> </ul> <p>The activity includes building up the road embankment, pavement layers and surfacing to its original condition and cross-section, and reinstate passage of traffic to safeguard the road users.</p>					
<b>Service Quality Standard</b>					
<ul style="list-style-type: none"> <li>• Reinstatement of roadway structure shall be attended to immediately as required, and within the response times given in the table below. For Reinstatement of Roadway Structure the response time shall be measured from completion of activity 8863 until the actual repair or replacement works start.</li> </ul>					
<b>Defect – Response Time</b>					
Service Level A		Service Level B		Service Level C	
<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>	<b>Defect</b>	<b>Response Time</b>
Damaged utility within road reserve being a hazard	Without delay	Damaged utility within road reserve being a hazard	Without delay	Damaged utility within road reserve being a hazard	Without delay

### 8900 MISCELLANEOUS FEATURES

#### 8901 Scope

Feature 8900 Miscellaneous Features covers interventions necessary for the successful implementation of all maintenance activities. Most importantly they would include all works required to implement safety and traffic control measures required at the work sites to warn and protect road users and workmen when maintenance works are being carried out on or close to the carriageway. It also includes preparatory activities such as planning, resources, materials, quality control and reporting necessary for successful implementation of road maintenance activities.

Feature 8900 – Miscellaneous Features comprises the following interventions and activities:

#### 8910 Traffic Control and Safety Measures

- 8911 Placement of Warning Signs Only
- 8912 Lane Closure
- 8913 Barricading Work Area
- 8914 Diversions
- 8919 Other Traffic Control and Safety Measures

#### 8920 Procurement of Materials for Maintenance Works

- 8921 Determining Materials Required
- 8922 Identifying Sources of Material
- 8923 Procurement of Materials
- 8924 Storage of Materials
- 8925 Transportation of Materials to Site
- 8929 Other Procurement of Materials for Maintenance Works

#### 8930 Process and Quality Control Testing

- 8931 Process Control Testing
- 8932 Quality Control Testing
- 8939 Other Process and Quality Control Testing

#### 8940 Sourcing and Extraction of Borrow Materials

- 8941 Investigation of Potential Borrow Area/Quarry
- 8942 Selection of the Most Suitable Borrow Area/Quarry
- 8943 Opening of Borrow Pit/Quarry and Extraction of Materials
- 8944 Loading and Hauling Borrow Materials
- 8945 Rehabilitation and Closure of Borrow Area/Quarry
- 8949 Other Sourcing and Extraction of Borrow Materials Issues

#### 8950 Tools and Equipment

- 8951 Safety and Health Tools
- 8952 Monitoring and Supervision Tools and Equipment
- 8953 Working Tools and Equipment
- 8954 Usage and Maintenance of Hand Tools
- 8955 Usage of Equipment and Vehicles

## Maintenance Standards for Road and Bridge Works

8956 Maintenance of Equipment and Vehicles

8959 Other Tools and Equipment

### **8960 Labour**

8961 Recruitment of Labour

8962 Conditions of Work

8963 Safety and Health of Personnel

8964 Payment of Wages

8969 Other Labour

### **8970 Reporting Forms**

8971 Resource Requirements and Cost Estimates for Maintenance Works

8972 Work Report and Resources Utilization

8979 Other Reporting Forms

### **8990 Other Miscellaneous Features**

Intervention 8990 is reserved for any miscellaneous feature that may be considered necessary to be executed within the above feature, but is not covered by other interventions in the feature.



## REFERENCES

Bridge Management System. (April 2005) **Visual Assessment Manual**, Roads Department, Gaborone, Botswana.

**Botswana Roads Design Manual**. (1982) Roads Department, Gaborone, Botswana.

Routine Maintenance Planning System (ROMAPS) **Raters Manual**, Roughton International, UK.

**Standard Specifications for Road and Bridge Works** (1983). Roads Department, Gaborone, Botswana.

PIARC (2000). **HDM-4. Highway Development and Management Series**. The World Road Association (PIARC), Paris, France.

Robinson, R, U Danielson and M Snaith (1998). **Road Maintenance Management, Concepts and Systems**. MacMillan Press Ltd, Basingstoke, UK.

SADC (2003). **Guideline on Low-volume Roads**. SADC Secretariat, Gaborone, Botswana.

TRL (1987). **Maintenance management for district engineers**. Overseas Road Note 1. Transport Research Laboratory. Crowthorne, UK.

### GLOSSARY OF TERMS

**Abutment**

A structure that provides support to a bridge deck and retains the road embankment.

**Activity**

Works to rectify a defect.

**Adhesion**

The action by means of which a fluid or plastic substance sticks to the surface of a solid body, for example, holding aggregate to the binder in chip sealing. It arises through intermolecular attraction between the contact surfaces.

**Adhesion Agent (Anti-Stripping Agent)**

A substance used for the purpose of improving the adhesion between a bituminous binder and the aggregate in the presence of water. It may be added to the binder or coated on to the aggregate in a solvent.

**Aggregate**

A granular material produced from deposits of sand, gravel, rock or metallurgical slag, using one or more of the following processes: selective extraction, screening, blasting, crushing.

**Apron**

Floor of concrete, masonry or stone at the inlet or outlet of a culvert or water way to prevent scour.

**Asphalt Concrete**

A mixture to predetermined proportions of aggregate, mineral filler and bituminous binder material prepared off the road and usually placed by means of a paving machine.

**Base Course**

A layer of material of defined thickness and width constructed on top of the subbase or, in the absence thereof, on top of the subgrade. A base may extend to or outside the carriageway.

**Benching**

A stepped platform cut in an embankment to prevent earth slipping. Can also be used as stepping to provide a level base for additional fill material.

**Berm**

A low ridge or bund of soil to redirect surface water.

**Bicycle Path**

A delineated path which may be part of or separate from the main carriageway of a road which is reserved for use by bicyclist.

**Binder**

Bitumen or bitumen emulsion, used to bind a wearing course, usually aggregate, to the pavement surface which may or may not have been previously primed or sealed. A binder is also used to hold aggregate together in bituminous mixtures.

**Bitumen**

Bitumen is a black to dark brown sticky material composed principally of high-molecular-weight hydrocarbons. Most bitumen is derived from the distillation of crude oil. Bitumen is a thermoplastic material that gradually liquefies when heated.

**Bleeding**

The exuding of the bituminous binder of a sealed pavement to such an extent that the binder may be picked up and spread by the traffic. This occurs mainly in warm weather.

**Blind**

To spread a thin layer of suitable material to absorb excess binder or to assist in remedying a slippery or loose condition, or to fill excess surface voids.

**Borrow Area**

An area within designated boundaries, approved for the purposes of obtaining borrow material. A borrow pit is the excavated pit in the borrow area.

**Borrow Material**

Any gravel, sand, soil, rock or ash obtained from borrow areas, dumps or sources other than cut within the road prism and which is used in the construction of the works. It does not include crushed stone or sand obtained from commercial sources.

**Box Culvert**

A culvert of rectangular cross-section constructed of reinforced concrete.

**Bridge**

A structure erected over a depression, river, water course, railway line, road or other obstacle for carrying motor, railway, pedestrian or other traffic, or services, and having a length measured between the abutment faces along the centre line at girder bed level, of 6 m or more, except that road-over-rail or rail-over-road structures are always classed as bridges.

**Brooming**

The use of a broom for distributing aggregate over the surface of a pavement or removal of loose material from a pavement prior to or after the application of a bituminous treatment.

**Camber**

The road cross-section in which each lane is sloping down from the crown towards shoulder breakpoint on a section of straight road alignment.

**Cause**

The reason that a defect has arisen.

**Causeway**

Low-level structure constructed across streams or rivers with openings to permit water to pass below road level.

**Carriageway**

The area normally travelled by vehicles and consisting of one or a number of contiguous traffic lanes but excluding shoulders.

**Catchment Area**

The area from which water runs off the surface by gravity to a collecting point.

**Catch Drain**

A surface drain constructed along the high side of a road or embankment outside the batter to intercept surface water.

**Catchpit**

A covered, accessible chamber with a sump for collection of silt forming part of the drainage system and permitting inspection and maintenance of underground drainage pipes.

**Centre-line**

The middle of the carriageway of an engineered road.

**Compaction**

Tamping of soil by hand rammers or mechanical rollers to increase the soil density.

## Annex B - Glossary of Terms

### **Corrugation**

A surface deformation into marked wave-like shapes at approximately equal distances and transverse to the line of traffic. (More common in unsealed gravel surfaces).

### **Crazing (Crocodiling)**

The cracking of a surface seal into small irregularly shaped contiguous areas.

### **Cross-fall**

The transverse gradient or fall across a formation or pavement or carriageway.

### **Cross-section**

Section through the road construction at right angles to the centreline.

### **Crown**

The highest part of a cambered surface, usually on or near road centreline.

### **Crushed Gravel**

A gravel in which all or some of the particles have been crushed.

### **Crushed Rock**

An aggregate made by crushing rock, as distinct from crushed gravel.

### **Crusher Run**

An aggregate produced by crushing without subsequent screening.

### **Crusher Dust**

The dust or fine particles produced by the crushing of gravel or rock.

### **Culvert**

A structure, other than a bridge, which provides an opening under the carriageway or median for drainage or other purposes.

### **Cut (Cutting)**

Excavation from the road prism, including side drains, excavations for crossroads, interchanges and, where classified as cut, excavations for open drains.

### **Cut-back Bitumen**

Bitumen, the viscosity of which has been temporarily reduced by the addition of a suitable volatile solvent, usually power kerosene.

### **Cut-off Drain**

A drain cut to intercept surface water flowing from adjacent land and to prevent it reaching a pavement or other prepared surface.

### **Cut-off Wall**

An impervious wall to prevent seepage or movement of water under or past a structure.

### **Cut Slope**

A soil/rock plane cut at an angle to the horizontal.

### **Cycle Path (Cycle Lane)**

A track which is used mainly for bicycle traffic. The track is separated from the rest of the road by kerb stone, similar structures or road marking.

**Defect**

The term Defect refers to the visible evidence of an undesirable condition in a Road Feature. A Defect may affect the safety, the serviceability, structural capacity or appearance of the asset.

**Ditch (Drain)**

A long narrow excavation designed or intended to collect and drain off surface water.

**Drainage**

The interception and removal of ground and surface water by artificial or natural means.

**Drainage Channel**

A waterway or gutter to carry away surface water.

**Drift**

A stream or river crossing at bed level over which the stream or river water can flow.

**Dry Grading**

Removing surface unevenness or corrugations using a grader without adding moisture.

**Dry Grading (Spoor)**

Making furrows in the sand track to assist drivers maintain position in the track.

**Edge Break**

The failure of the edge of the surfacing up to a minimum width of 300 mm from the continuous edge of the surfacing.

**Edge Damage**

Damage to the road edge surface by potholes, erosion runnels, corrugations, loss of cross-fall, edge drops and grass growing on unpaved shoulder.

**Edge Fretting**

Loss of the seal and pavement material along the edge of a pavement which may vary in depth and severity.

**Earthworks**

General term of construction works involving excavation, loading, hauling, spreading and compaction of soil and rock.

**Embankment Slope**

An artificially constructed soil plane at an angle to the horizontal.

**Emergency Works**

Any repair needed without delay for the purpose of ensuring public safety, relieving unnecessary traffic congestion, or maintaining structural integrity of a part of the road.

**Emulsified Bitumen**

The suspension of bitumen, in a state of extremely fine division, in water by means of one or more suitable emulsifying or stabilising agents. There are two types of emulsified bitumen: Anionic in which the bitumen particles are negatively charged and Cationic in which the bitumen particles are positively charged.

**Encroachment**

Unauthorized placing and leaving wilfully on the road or road reserve of signs or other objects, materials, physical structures or interventions of any kind, fire or matters causing offensive smell or other offensive matter.

## Annex B - Glossary of Terms

### **Enrichment Seal (Fogspray)**

A light application of bituminous material, with or without a fine aggregate cover for the purpose of increasing the binder content of a bituminous road surface.

### **Fatty Surface**

A sealed pavement containing an excess of bituminous binder which may be in contact with the traffic. The wearing course is either partly or completely submerged.

### **Fill (Embankment)**

The portion of the subgrade composed of approved imported material which lies above the road bed and is bounded by the side slopes, shown on the typical cross-sections on the Drawings, running downwards and outwards from the outer shoulder breakpoints and on which the selected subgrade, subbase, base, shoulders and, in the case of dual carriageways, the median are to be constructed. Material which is imported to replace unsuitable material excavated from the roadbed is also classified as fill.

### **Foamed Bitumen**

Hot bitumen greatly expanded in volume by the introduction of steam.

### **Footbridge**

The overpass bridge crossing carriageway/railway to ensure the safety of pedestrian and smooth passage of vehicular traffic.

### **Footpath (Walkway, Sidewalk)**

A track used for passage of pedestrians. The track may be separated from other parts of the road by kerb stone, similar structures or road marking.

### **Gabion**

A steel mesh cage filled with cobble stone or crushed stone and mainly used for revetment and slope protection.

### **Gravel**

A non-cohesive coarse granular material, resulting from natural disintegration of rock with or without fine material.

### **Guardrail**

A safety barrier on an embankment or river crossing, footbridge, pedestrian way, etc.

### **Gutter**

A shallow waterway provided at the edge of the road to carry surface water away from the road.

### **Headwalls**

The walls located on the top of outlet/inlet of culvert. The walls of inlet direct the flow into the culvert while the walls of outlet provide a transition from the culvert to the outlet channel. Headwalls also protect the embankment from erosion by flood waters.

### **Heaving**

Upward movement of material caused by expansion of displacement resulting from causes such as moisture absorption.

### **Hungry Surface**

A surface in which the binder appears deficient, or to have hardened and become rigid and which may be cracked and crazed but is otherwise sound. The surface may be porous.

### **Inlet**

The point at which surface water enters a culvert.

### **Invert**

The lowest point of the internal cross section of a ditch or culvert, etc.

### **Key Performance Indicators (KPI)**

The term Key Performance Indicators is used in the manual to describe performance indicators that are selected to enforce an OPRC by verifying if the agreed Service Levels have been complied with by the contractor, without having to monitor the performance of all activities. KPIs have been selected for each Intervention and generally from the activity or activities that most affect the performance of the Intervention.

### **Labour Based Methods**

Work methods which use a combination of equipment and labour. The combination is often chosen to achieve a balance between employment generation and productivity while remaining cost effective.

### **Labour Intensive Methods**

Work methods which use labour wherever possible and machinery only when necessary.

### **Lane**

The width of carriageway required to accommodate one line of traffic.

### **Maintenance**

All works of every description which are required for the preservation and upkeep of a road or its associated works or both, so as to prevent the deterioration of quality and efficiency to a noticeable extent below that which pertained immediately after construction.

### **Maintenance Standards (MS)**

The term Maintenance Standards is a generic term used in the manual to embrace all other terms that define when, why and how maintenance activities should be carried out.

### **Maintenance Performance Standards (MPS)**

The RD's minimum maintenance operational standards for all defined maintenance Activities at three different Service Levels (SL). The MPS for each Activity includes a description of the maintenance intervention and the objective of doing it; the Defect(s) that necessitate the Activity, its Causes and Effects as well as defined Threshold Levels and Response Times. The methods to be used for each repair Activity, the materials, workmanship and miscellaneous other requirements are described in MOPRBW.

### **Maintenance Performance Indicators (MPI)**

Describes the tool used to verify or evaluate compliance with set goals and objectives.

### **Manhole**

Accessible chamber with a cover forming part of the drainage system and permitting inspection and maintenance of underground drainage pipes.

### **Measurement Contract**

A contract where payment is made on the basis of the quantity of work completed to a technical specification.

### **Mitre Drain**

Drain constructed at an angle to the centre line of the road to divert water from the side drains. Mitre drains include mitre banks placed across side drains.

### **Nominal Size**

A designation of an aggregate, chosen to give an indication of the largest size particle present.

### **Open Sub-soil Drain**

An open drain provided for the collection and removal of sub-soil water rather than surface water.

## Annex B - Glossary of Terms

### **Original Ground Level**

Line of natural ground.

### **Outfall**

The point at which water discharges from a pipe or box culvert.

### **Outlet**

Channel along which water is discharged from culverts, stormwater conduits and minor bridges.

### **Paved Road**

For the purpose of this manual a paved road is a road with a concrete surface, concrete block, bituminous surface or surface dressing.

### **Pavement**

The upper layers of the road comprising the selected subgrade, subbase, base, shoulders and surfacing.

### **Pavement Distress**

The deterioration of the pavement evidenced by visible surface defects.

### **Patching**

The filling up or repair of depressions, holes, or other defective places in a carriageway with additional material to restore the surface.

### **Pedestrian Path**

A track used for passage of pedestrians. The track may be separated from other parts of the road by road marking, kerb stone, or similar structures.

### **Performance Contract**

A contract where payment is made when the condition of the road is at or above a defined performance standard or level of service.

### **Performance Specifications.**

The term used for what is part of the standard bidding documents for OPRC and would typically include:

- (i) A specification of the Service Levels ( Maintenance Standards) required on the roads included in the contract;
- (ii) the methods and procedures to be applied for measuring compliance with service quality levels;
- (iii) the penalties and/or payment reductions applied in case of non-compliance,
- (iv) the initial rehabilitation works and the improvement works the contractor will have to carry out in addition to the general Management and Maintenance Services and Works, and
- (v) other aspects, such as the internal organization of the contractor, etc.  
(Items (i) and (ii) above would be included in the MSRBW).

### **Periodic Maintenance**

Activities that are required only at intervals of several years. need to be carried out on a road after a number of years. For example regravelling of unpaved roads or resealing of paved roads.

### **Pedestrian Way**

A walkway permitting pedestrians to go from one place to another without passing through traffic.

### **Pipe Culvert**

A culvert of circular cross section usually constructed in precast concrete.



**Polished Surface**

A sealed surface where traffic has so worn the exposed aggregate that there is insufficient frictional grip between the aggregate wearing course and the traffic tyres, especially in a wet condition.

**Pothole**

A hole in the surface of a pavement frequently rounded in shape, resulting from loss of pavement material, which is the initial stage may be the depth of the seal only, or in the advancing stages may result in the loss of pavement material, the subgrade and the shoulder pavement edge support.

**Precoating**

The coating of aggregate with a liquid to improve the rate at which it is wetted by a bituminous binder.

**Premix**

Premix is a paving material manufactured by mixing aggregates, filler and bitumen. Most premix is mixed and placed hot. Premix is used in the construction of wearing course, binder courses and base courses.

**Prime**

A low viscosity binder applied to a prepared pavement prior to the initial application of a seal.

**Profile**

The shape of a pavement surface or layer measured as vertical distances from some datum. Profiles may be longitudinal (parallel to the traffic flow) or transverse (at right angles to the traffic flow).

**Railway Crossing**

Level intersection of road and railway tracks.

**Ravelling**

The loosening of stones or particles forming the wearing course of a sealed pavement.

**Reflection Cracking**

A visible crack in the wearing course resulting from the propagation of cracks in the underlying pavement layer.

**Recurrent Maintenance**

Activities required at intervals throughout the year, but whose frequency varies with traffic. Examples include grading of unpaved roads or pothole repairs on a paved road.

**Reseal**

A sprayed seal applied to an existing sealed surface.

**Regravelling**

Adding a layer of gravel to a gravel surfaced road.

**Reshaping**

Heavy grading to restore the road formation.

**Response Time (RT).**

The term Response Time is used in the manual to describe the maximum time, from the time the deficiency was detected or reported until such time when the Contractor (or RD) must complete the described Maintenance Activity by repairing the Deficiency/Defects indicated. For periodic maintenance activities, or for routine maintenance activities that require a long time to complete, the response time is defined the maximum time from the time the deficiency/defect was detected or reported as until the Contractor or the Road Authority undertakes the execution of the intervention as set out in the applicable Maintenance Standard.

## Annex B - Glossary of Terms

### **Retaining Wall**

A wall built to hold back earth or other solid material.

### **Road Feature**

The term Road (Maintenance) Feature is used to identify a physical element of the road infrastructure asset which is the subject of a maintenance Intervention/Activity, e.g. Road Feature = Road Reserve - Code 8100; Road Intervention = Rest Area Maintenance - Code 8130; Road Activity = Rest Area Cleaning - Code 8131.

### **Road Furniture**

Road or street furniture e.g. traffic sign, traffic board, traffic signal, lane marking, guardrail, street light, etc.

### **Road Reserve (Servitude)**

The area of land reserved for the construction and maintenance of the road and for the accommodation of utility services.

### **Roadway**

The area normally used by vehicles and consisting of one or a number of contiguous traffic lanes, including auxiliary lanes and shoulders.

### **Routine Maintenance**

Activities that are likely to be required irrespective of the engineering characteristics of the road or the volume of traffic. Examples include grass cutting and drain cleaning.

### **Rutting**

The vertical deformation of a pavement surface measured in a wheel path relative to a straight edge placed at right angles to the traffic flow and across the wheel path.

### **Sand**

Natural mineral particles which will pass through a defined sieve (normally 4.75 mm or 2.36 mm sieve) and which are free of appreciable quantities of clay and silt.

### **Sand-asphalt**

A mixture of bitumen and sand, with or without a filler.

### **Sand Cushioning**

Laying a thin layer of sand on a hard gravel surface.

### **Scour Checks**

The structures to prevent scouring of drains. Simple scour checks may be constructed of wood pegs or stones. All scour checks should have an apron downstream built of stones or grass turfs pinned to the ditch invert with wooden pegs.

### **Segregation**

Separation of the coarse aggregate from the remainder of the bituminous mix.

### **Service Quality Standard (SQS).**

The term Service Quality Standard is used at activity level to describe the desired standard of a road (maintenance) feature. A Defect on a road feature means that the required SQS is not attained.

### **Shoulder**

(a) When the shoulder is referred to as a surface: The area between the outside edge of the carriageway and the shoulder breakpoint. (b) When shoulder is referred to as a pavement layer: The layer on top of the subbase or, in the absence of a subbase, on top of the subgrade and lying between the outside edge of the base and the shoulder breakpoint.

**Shoulder Drain**

A drain through the shoulder to drain the pavement and/or the subgrade.

**Shoving**

Lateral displacement of a pavement structure (usually bitumen bound) by braking, accelerating or turning vehicles.

**Side Drain**

Open longitudinal drain situated adjacent to and at the bottom of cut or fill slopes.

**Slick Surface**

A surface that reflects light to the extent that the motorist is aware of the condition. Droppings of oil, petrol and grease from traffic can sometimes cause these conditions.

**Slope**

Unless otherwise stated, slope is given in terms of the ratio of vertical difference in elevation between any two points and the horizontal distance between them.

**Slurry**

A road surface treatment consisting of a thin layer of a mixture of bitumen emulsion, water and fine aggregate applied to a surfacing in the form of a slurry.

**Spot Improvements**

Maintenance or rehabilitation activities at isolated sites along a road to provide basic access. The appearance of the road will vary along its length.

**Stripping**

The loss under traffic of the aggregate wearing course from a bituminous sealed pavement.

**Stockpile**

A heap or stack of material held in stock for future use.

**Straight-run Bitumen**

The bitumen obtained after the final stage of distillation of a crude petroleum.

**Subbase**

The layer of material of specified dimensions on top of the subgrade and below the base and shoulders.

**Subgrade**

The earthworks constructed on the roadbed up to the floor of the subbase or, in the absence of a subbase, up to the floor of the base and shoulders.

**Subway**

A structure providing passage for vehicular and/or pedestrian traffic under an existing road, railway, etc.

**Superelevation**

The raising of the outside level of the road on curves to reduce the effect of centrifugal forces and improve road holding quantities.

**Surfacing**

Top layer of the pavement. Consists of wearing course, and sometimes a base course or binder course

## Annex B - Glossary of Terms

### **Surfacing (Treatment)**

The sealing or resealing of the carriageway or shoulders by means of one or more successive applications of bituminous binder or tar and crushed stone aggregate, natural gravel, river sand, crusher dust or Kalahari sand.

### **Table Drain**

A side-drain of a road adjacent to the shoulders, and part of the formation.

### **Threshold Level (TL)**

The term Threshold Level (TL) describes the maximum tolerable deficiency, such as roughness, rutting and cracking on a paved road.

### **Tack Coat**

Asphalt material to bond lower layer (asphalt material or cement) and upper layer (asphalt mixture). It is sprayed on surface of lower layer.

### **Technical Specification**

Describes the detail (dimensions, materials, etc.) of a road, or the output of a maintenance or rehabilitation activity.

### **Traffic Lane**

The portion of the carriageway defined by road marking for the movement of a single line of vehicles.

### **Transverse Joint**

A joint at right angles to the road centreline.

### **Transverse Joint Taper**

Slope or ramp of asphalt mix at the end of a freshly laid asphalt course.

### **Unpaved Road**

For the purpose of this manual an unpaved road refers to a road with a gravel or earth/sand surface.

### **Upgrading**

Activities to increase capacity or arise a road to a higher road type, for instance providing an improved surface to a gravel road.

### **Veterinary Dip**

A concrete structure constructed as a drift on the carriageway or off the roadway used for animal disease control purposes.

### **Water Table**

The level at which ground water would finally stand in an unpumped hole or depression.

### **Wearing Course**

The part of the road surface in contact with traffic wheels.

### **Wing Wall**

A wall at a bridge or culvert abutment to retain and protect the embankment fills behind the abutment.

### **Waterway**

The area along a river or a stream.

### **Wet Grading**

Removal of surface unevenness by grading a moistened surface.

## Annex C - List of Maintenance Features, Interventions and Activities

<p><b>8100 ROAD RESERVE</b></p> <p><b>8101 Scope</b></p> <p><b>8110 Vegetation Control</b></p> <p>8111 Grass Cutting</p> <p>8112 Creeper Grass Removal</p> <p>8113 Bush Clearing</p> <p>8114 Trees Trimming</p> <p>8115 Trees Removal</p> <p>8116 Morama Tuber Removal</p> <p>8117 De-stumping</p> <p>8119 Other Vegetation Control</p> <p><b>8120 Animals Control</b></p> <p>8121 Fence Repair</p> <p>8122 Gate Repair</p> <p>8123 Cattle Grid Repair</p> <p>8124 Keeping Animals off Road Reserve</p> <p>8125 Moles Control</p> <p>8129 Other Animals Control</p> <p><b>8130 Rest Area Maintenance</b></p> <p>8131 Rest Area Cleaning</p> <p>8132 Rest Area Facilities Repair</p> <p>8133 Rest Area Reshaping</p> <p>8134 Rest Area Regravelling</p> <p>8135 Rest Area Resealing</p> <p>8136 Rest Area Fogspray</p> <p>8137 Rest Area Bituminous Overlay</p> <p>8139 Other Rest Area Maintenance</p> <p><b>8140 Litter Control and Obstacles Removal</b></p> <p>8141 Litter Collection and Removal</p> <p>8142 Obstacles Collection and Removal</p> <p>8143 Dead Animals Removal</p> <p>8144 Abandoned Vehicles and Scrap Removal</p> <p>8145 Anthills Removal</p> <p>8146 Illegal Signs and Other Encroachments Removal</p> <p>8149 Other Litter Control and Obstacles Removal</p> <p><b>8150 Slopes Maintenance</b></p> <p>8151 Slope Erosion Prevention</p>	<p>8152 Slope Erosion Repair</p> <p>8159 Other Slopes Maintenance</p> <p><b>8160 Landscaped Areas Maintenance</b></p> <p>8161 Trees, Grass and Flowers Planting</p> <p>8162 Trees, Grass and Flowers Watering</p> <p>8163 Trees, Grass and Flowers Cutting and Trimming</p> <p>8164 Special Features Maintenance</p> <p>8165 Landscaped Areas Cleaning</p> <p>8169 Other Landscaped Areas Maintenance</p> <p><b>8200 PAVED ROADWAY</b></p> <p>8201 Scope</p> <p><b>8210 Bituminous Paved Roadway Routine Maintenance</b></p> <p>8211 Paved Roadway Cleaning</p> <p>8212 Rutting and Depression Repair</p> <p>8213 Pothole Patching, Edge Damage and Surface Failure Repair</p> <p>8214 Unpaved Shoulder Maintenance</p> <p>8215 Crack Sealing</p> <p>8216 Bleeding Repair</p> <p>8217 Salt Blisters Repair</p> <p>8219 Other Bituminous Paved Roadway Routine Maintenance</p> <p><b>8220 Bituminous Paved Roadway Periodic Maintenance</b></p> <p>8221 Fogspray</p> <p>8222 Resealing</p> <p>8223 Bituminous Overlay</p> <p>8224 Unpaved Shoulder Regravelling and Edge Drop Repair</p> <p>8225 Unpaved Shoulder Reshaping</p> <p>8229 Other Bituminous Paved Roadway Periodic Maintenance</p> <p><b>8230 Concrete Paved Roadway Maintenance</b></p> <p>8231 Concrete Roadway Cleaning</p> <p>8232 Concrete Roadway Crack Sealing</p> <p>8233 Concrete Roadway Spalling Repair</p> <p>8234 Concrete Roadway Pothole Repair</p> <p>8235 Concrete Roadway Joint Stepping Repair</p>
--	---

## Annex C - List of Maintenance Features, Interventions and Activities

8236	Concrete Roadway Slab Repair	<b>8400 DRAINAGE FACILITIES</b>
8239	Other Concrete Paved Roadway Maintenance	8401 Scope
<b>8240</b>	<b>Block Paved Roadway Maintenance</b>	<b>8410 Culvert Maintenance</b>
8241	Block Paved Roadway Cleaning	8411 Culvert Cleaning
8242	Block Paved Roadway Deformation Repair	8412 Culvert Headwall, Wing Wall and Marker Post Repainting
8243	Paving Blocks Replacement	8413 Culvert Headwall, Wing Wall, Inlet and Outlet Structure Repair
8244	Blocked Paved Roadway Grass Removal	8414 Culvert Repair
8249	Other Block Paved Roadway Maintenance	8415 Culvert Marker Post Reinstatement/Replacement
<b>8250</b>	<b>Paved Footpath and Cycle Path Maintenance</b>	8416 Culvert Marker Post Reflector Replacement
8251	Paved Footpath and Cycle Path Cleaning	8419 Other Culvert Maintenance
8252	Paved Footpath and Cycle Path General Surface Repair	<b>8420 Drain Maintenance</b>
8259	Other Paved Footpath and Cycle Path Maintenance	8421 Drain Clearing, Cleaning, and Desilting
<b>8300</b>	<b>UNPAVED ROADWAY</b>	8422 Unlined Drain Erosion Repair
8301	Scope	8423 Unlined Drain Reshaping
<b>8310</b>	<b>Unpaved Roadway Routine Maintenance</b>	8424 Drain Lining Repair
8311	Dragging	8425 Concrete Lining Joints Repair
8312	Maintenance of Sand Cushioning Layer	8426 Concrete Lining Weep Holes Cleaning
8313	Dry Grading	8427 Drain Cover Repair/Replacement
8314	Unpaved Roadway Pothole Patching	8429 Other Drain Maintenance
8315	Unpaved Roadway Erosion Runnels Repair	<b>8430 Catchpit, Manhole and Drainage Pipe Maintenance</b>
8316	Dust Prevention	8431 Catchpit, Manhole and Drainage Pipe Cleaning and Clearing
8319	Other Unpaved Roadway Routine Maintenance	8432 Manhole/Catchpit Cover Replacement
<b>8320</b>	<b>Unpaved Roadway Periodic Maintenance</b>	8433 Drainage Pipe Relaying/Replacement
8321	Wet Grading	8434 Catchpit/Manhole Repair
8322	Reshaping	8435 Drainage Pipe Repair
8323	Regravelling	8439 Other Catchpit, Manhole and Drainage Pipe Maintenance
8324	Sand Cushioning	<b>8440 Erosion Protection Works Maintenance</b>
8329	Other Unpaved Roadway Periodic Maintenance	8441 Stone Pitching Repair
<b>8330</b>	<b>Unpaved Footpath and Cycle Path Maintenance</b>	8442 Concrete Erosion Protection Works Repair
8331	Unpaved Footpath and Cycle Path Cleaning	8443 Gabion Repair
8332	Unpaved Footpath and Cycle Path General Surface Repair	8444 Scour Check and Chute Repair
8339	Other Unpaved Footpath and Cycle Path Maintenance	8445 Berm Maintenance
		8449 Other Erosion Protection Works Maintenance

## Annex C - List of Maintenance Features, Interventions and Activities

<b>8500 BRIDGES</b>	<b>8620 Retaining Wall Maintenance</b>
8501 Scope	8621 Retaining Wall Minor Repairs
<b>8510 Bridge Routine Maintenance</b>	8622 Retaining Wall Weep Holes Cleaning
8511 Bridge Deck Cleaning	8623 Retaining Wall Vegetation Clearing
8512 Bridge Joints, Scupper Drains and Weep Holes Cleaning	8629 Other Retaining Wall Maintenance
8513 Bridge Bearings Cleaning	<b>8630 Railway Crossing Maintenance</b>
8514 Bridge Erosion Repair	8631 Railway Crossing General Repair
8515 Bridge Concrete Repair	8639 Other Railway Crossing Maintenance
8516 Bridge Wearing Surface Maintenance	<b>8640 Veterinary Dip Maintenance</b>
8517 Bridge Rail, Safety Barrier and Parapet Maintenance and Minor Repairs	8641 Veterinary Dip General Repair
8518 Bridge Steel Component Repair	8649 Other Veterinary Dip Maintenance
8519 Other Bridge Routine Maintenance	<b>8650 Subway Maintenance</b>
<b>8520 Bridge Periodic Maintenance</b>	8651 Subway General Repair
8521 Bridge Bearings Realignment and Replacement	8659 Other Subway Maintenance
8522 Bridge Rust Removal and Repainting	<b>8660 Weighbridge Area Maintenance</b>
8523 Bridge Steel Component Replacement	8661 Weighbridge Area General Repair
8524 Bridge Inspection	8669 Other Weighbridge Area Maintenance
8529 Other Bridge Periodic Maintenance	<b>8700 ROAD FURNITURE, SIGNS AND TRAFFIC MARKINGS</b>
<b>8530 Waterway Maintenance and Repair</b>	8701 Scope
8531 Waterway Debris and Obstacles Removal	<b>8710 Road Furniture Maintenance</b>
8532 Waterway Erosion Repair	8711 Guardrail Maintenance
8533 Waterway Desilting	8712 Kerbstone Maintenance
8539 Other Waterway Maintenance and Repair	8713 Kerb Maintenance
<b>8600 MISCELLANEOUS STRUCTURES</b>	8714 Distance Marker Maintenance
8601 Scope	8715 Pedestrian Railing Maintenance
<b>8610 Drift, Causeway and Ferry Landing Maintenance</b>	8716 Street Lighting Maintenance
8611 Drift, Causeway and Ferry Landing Structure Damage Repair	8717 Traffic Signalling Devices Maintenance
8612 Waterway Cleaning and Clearing	8719 Other Road Furniture Maintenance
8613 Unlined Drift Reshaping	<b>8720 Road Signs Maintenance</b>
8614 Marker/Guide Post Reinstatement/Replacement	8721 Road Sign Cleaning
8615 Marker/Guide Post Repainting	8722 Road Sign Repainting
8616 Marker/Guide Post Reflector Replacement	8723 Road Sign Repairs
8617 Grouted Stone Pitching Repair	8724 Road Sign Replacement
8619 Other Drift, Causeway and Ferry Landing Maintenance	8729 Other Road Signs Maintenance

## Annex C - List of Maintenance Features, Interventions and Activities

### **8730 Road Marking Maintenance**

- 8731 Road Marking Repainting
- 8732 Reflective Stud Maintenance
- 8739 Other Road Marking Maintenance

### **8740 Rumble Strips and Speed Hump Maintenance**

- 8741 Rumble Strips Maintenance
- 8742 Speed Hump Maintenance
- 8749 Other Rumble Strips and Speed Hump Maintenance

### **8800 EMERGENCIES**

- 8861 Scope

### **8810 Flooding and Washout Repair**

- 8811 Traffic Control, Safety Measures and Notification
- 8812 Construction of Diversions
- 8813 Excavation and Removal of Unsuitable Material
- 8814 Reinstatement of Roadway Structure
- 8819 Other Flooding and Washout Repair

### **8820 Land Slide Removal**

- 8821 Traffic Control, Safety Measures and Notification
- 8822 Construction of Diversions
- 8823 Excavation and Removal of Material from Roadway
- 8824 Reinstatement of Roadway Structure
- 8829 Other Land Slide Removal

### **8830 Major Obstacles Removal**

- 8831 Traffic Control, Safety Measures and Notification
- 8832 Construction of Diversions
- 8833 Removal of Major Obstacle
- 8834 Repair Damage to Pavement
- 8839 Other Major Obstacles Removal

### **8840 Damaged/Washed Out Culvert Replacement**

- 8841 Traffic Control, Safety Measures and Notification
- 8842 Construction of Diversions
- 8843 Removal of Existing Culvert
- 8844 Repair and Replacement of Culvert
- 8845 Excavation and Backfilling
- 8846 Reinstatement of Pavement and Embankments
- 8849 Other Damaged/Washed Out Culvert Replacement

### **8850 Damaged/Washed Out Miscellaneous Structures Replacement**

- 8851 Traffic Control, Safety Measures and Notification
- 8852 Construction of Diversions
- 8853 Removal of Existing Structure
- 8854 Repair and Replacement of Structure
- 8855 Excavation and Backfilling
- 8856 Reinstatement of Pavement and Embankments
- 8859 Other Damaged/Washed Out Miscellaneous Structures Replacement

### **8860 Repair to Damaged Utilities Within the Road Reserve**

- 8861 Traffic Control, Safety Measures and Notification
- 8862 Construction of Diversions
- 8863 Repair of Damaged Utilities Within the Road Reserve
- 8864 Reinstatement of Roadway Structure
- 8869 Other Repair to Damaged Utility Within the Road Reserve

### **8890 Other Emergencies**

### **8900 MISCELLANEOUS FEATURES**

- 8901 Scope

### **8910 Traffic Control and Safety Measures**

- 8911 Placement of Warning Signs Only
- 8912 Lane Closure
- 8913 Barricading Work Area
- 8914 Diversions
- 8919 Other Traffic Control and Safety Measures

### **8920 Procurement of Materials for Maintenance Works**

- 8921 Determining Materials Required
- 8922 Identifying Sources of Material
- 8923 Procurement of Materials
- 8924 Storage of Materials
- 8925 Transportation of Materials to Site
- 8929 Other Procurement of Materials for Maintenance Works



## Annex C - List of Maintenance Features, Interventions and Activities

### **8930 Process and Quality Control Testing**

- 8931 Process Control Testing
- 8932 Quality Control Testing
- 8939 Other Process and Quality Control Testing

### **8940 Sourcing and Extraction of Borrow Materials**

- 8941 Investigation of Potential Borrow Area/Quarry
- 8942 Selection of the Most Suitable Borrow Area/Quarry
- 8943 Opening of Borrow Pit/Quarry and Extraction of Materials
- 8944 Loading and Hauling Borrow Materials
- 8945 Rehabilitation and Closure of Borrow Area/Quarry
- 8949 Other Sourcing and Extraction of Borrow Materials

### **8950 Tools and Equipment**

- 8951 Safety and Health Tools
- 8952 Monitoring and Supervision Tools and Equipment
- 8953 Working Tools and Equipment
- 8954 Usage and Maintenance of Hand Tools
- 8955 Usage of Equipment and Vehicles
- 8956 Maintenance of Equipment and Vehicles
- 8959 Other Tools and Equipment

### **8960 Labour**

- 8961 Recruitment of Labour
- 8962 Conditions of Work
- 8963 Safety and Health of Personnel
- 8964 Payment of Wages
- 8969 Other Labour

### **8970 Reporting Forms**

- 8971 Resource Requirements and Cost Estimates for Maintenance Works
- 8972 Work Report and Resources Utilization
- 8979 Other Reporting Forms

### **8990 Other Miscellaneous Features**