RMF
Roads Maintenance Forum

MAINTENANCE MANAGEMENT SYSTEM

# Mpumalanga Province
# Road Maintenance Management System

public works, roads & transport
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

24 July 2025

ZUTARI IMPACT. ENGINEERED.

CSIR Touching lives through innovation
CESA Consulting Engineers South Africa
SANRAL
IMESA
SAFCEC
SARF better roads
Society for Asphalt Technology
sabita

# DPWR&T: Challenges

1. **Aging Road Network:** Managing a vast and aging road infrastructure needs systematic maintenance to prevent deterioration and manage repairs proactively.

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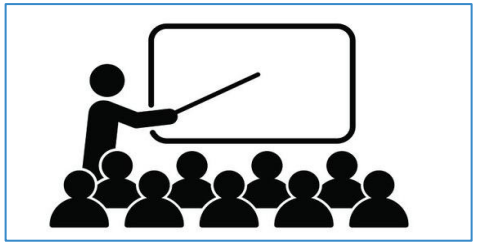
2. **Limited Operational Expenditure (Opex) Budget**: With a constrained budget for road maintenance, the department needed a solution that would ensure cost-effective allocation and prevent overspending.

3. **Resource Constraints:** The department faces significant limitations in both financial and manpower resources, requiring a systematic change in how resources are managed to optimize their use efficiently.

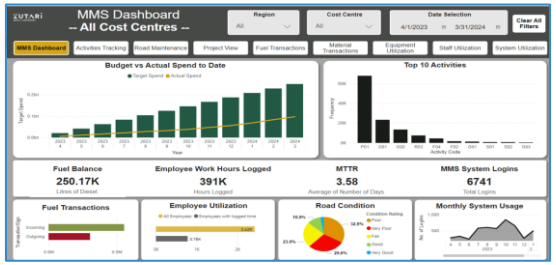
4. **Resource Management:** There is a critical need in the department need to streamline maintenance activities, monitor resource use, and reduce waste to maintain road quality within available means.

# Maintenance Improvement Programme

## Roadworker Maintenance Execution Training



## Real-time Monitoring Dashboard

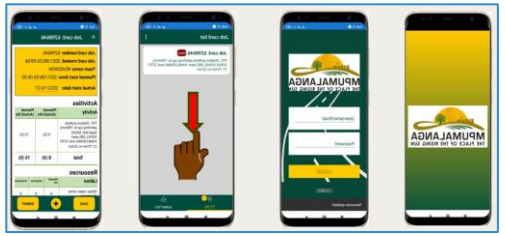



## Road Maintenance Management System

Maintenance Management System

## Public Pothole Reporting Site


## MMS Mobile App



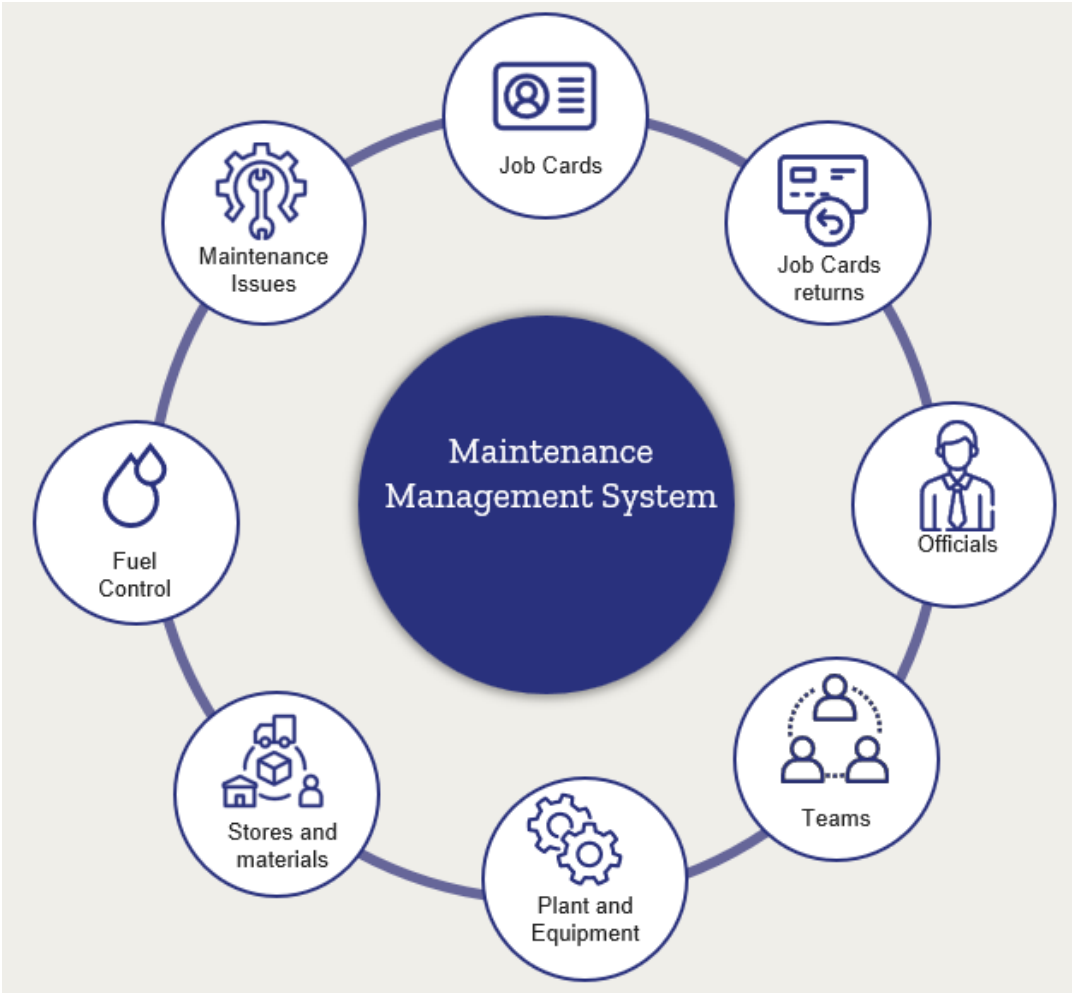
# Maintenance Management System (CMMS) Operations – High level

- Maintenance Management System software centralizes maintenance information and facilitates the processes of maintenance operations.
- It assist organizations to optimize their work order processes, utilization of physical equipment like vehicles, machinery,  as well as keeping track of executed maintenance activities, control of fuel and materials, and reporting etc.

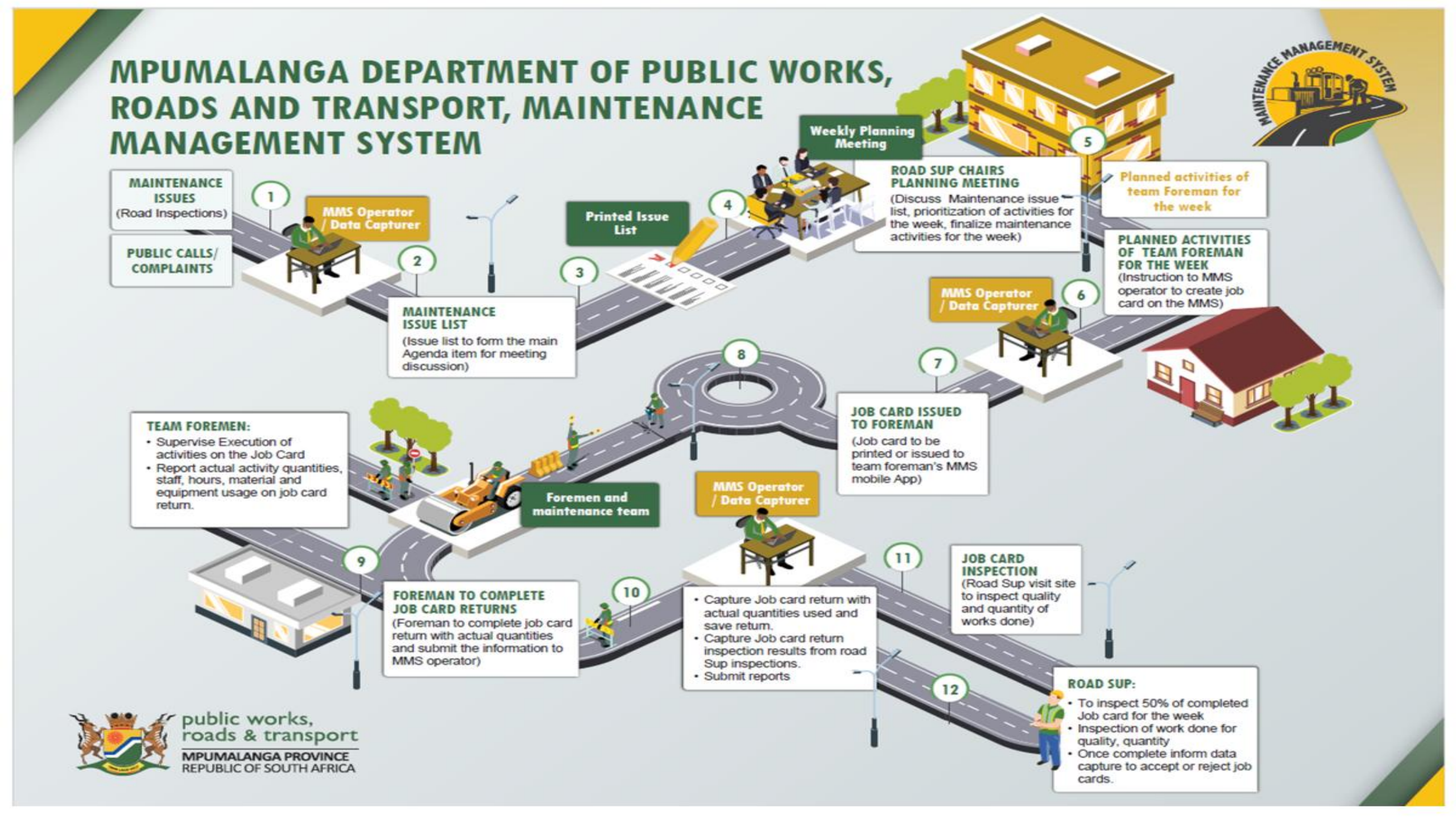
# Mpumalanga Maintenance Management System – Primary Process

**The MMS can assist organization with the:**

- **Recording** of maintenance issues (inspections/public calls)
- **Planning** of maintenance activities
- **Budgeting** to address maintenance needs
- **Scheduling** of maintenance activities and resources to achieve maintenance objectives
- **Execution** of maintenance activities (Keeping record)
- **Feedback** regarding activities carried out and resources applied (Quality control and assurance)
- **Evaluation** of the amount of work done compared to planned workload and resource utilization
- **Monitoring and control** of labor and resource utilization
- **Reporting** of cost centers and regional offices to head office



# MPUMALANGA DEPARTMENT OF PUBLIC WORKS, ROADS AND TRANSPORT, MAINTENANCE MANAGEMENT SYSTEM

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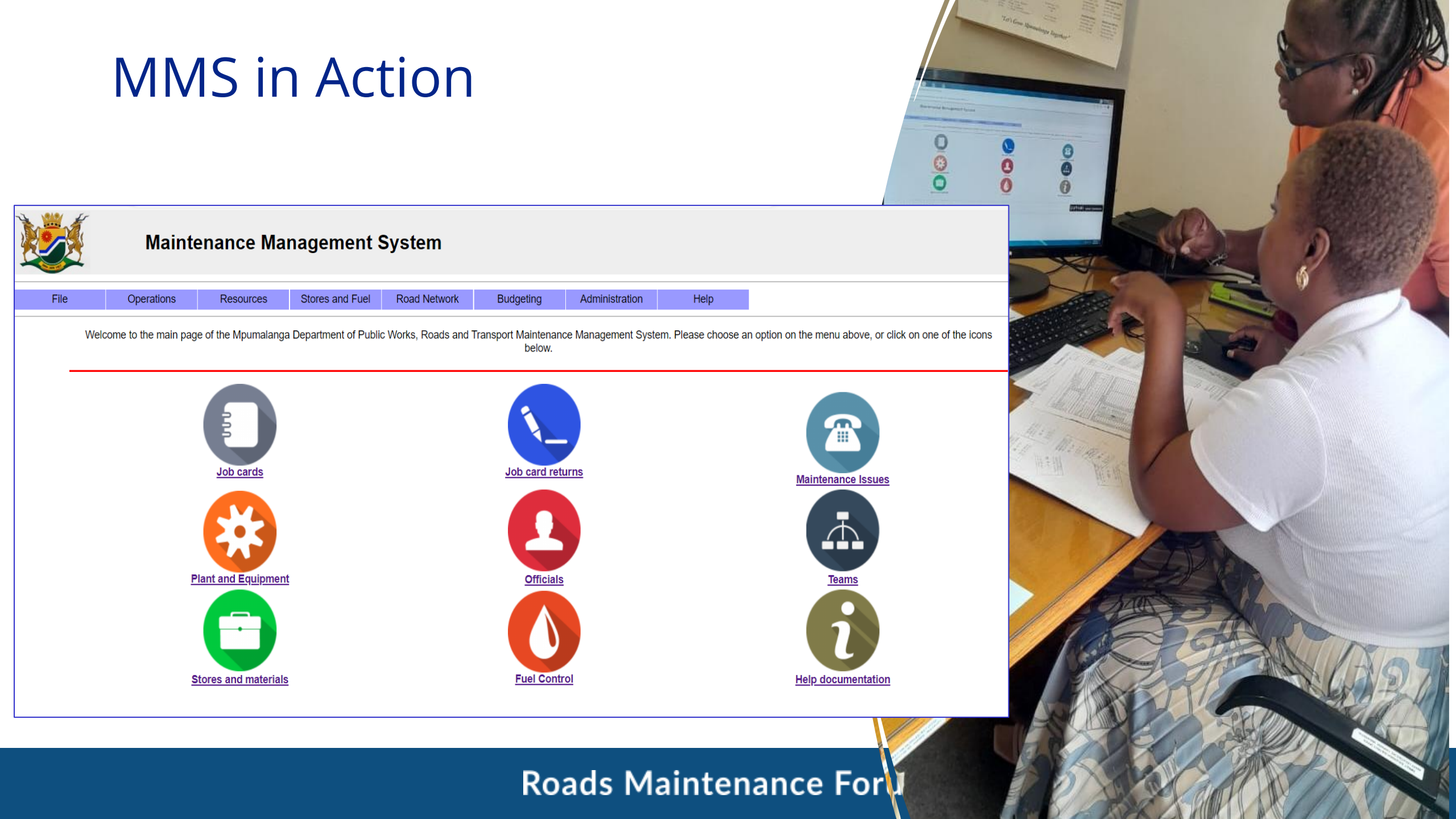
# MMS in Action



# Mpumalanga Maintenance Management System – MMS – System Capabilities

## MMS-System Capabilities (1)

### Road Network Inventory

- Contains road links, structures and road furniture
- RNI imported from dTIMS and GIS

### Budgeting capabilities

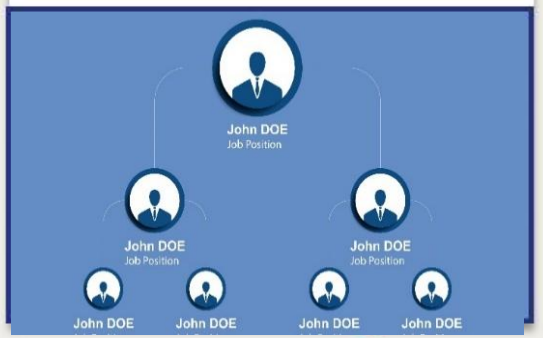
- Actual vs planned budget reports throughout the cycle
- Allows for budgeting at multiple organizational levels

### Work order management / Maintenance Execution

- Issuing of job cards at cost center level
- Allows for upload photos of completed work for QA
- Job inspections by supervisors for quantity and quality


### Organizational Data

- Database of officials / staff
- Maintenance teams
- Term contractor's
- database
- MMS system users



# Mpumalanga Maintenance Management System – MMS – System Capabilities

## MMS - System Capabilities (2)

### Materials and Fuel Control

- Reporting on materials and fuel used during jobs
- Reconciliations between quantities used and issued and receipts

### Equipment / Yellow Fleet

- Database of all motorized equipment
- Allows for capturing of service and repair records captured
- Movement records
- Fuel receipts for equipment

### MMS Android Mobile App

- Job card returns can be submitted and uploaded from anywhere long as there is network
- Allows Foreman to update quantities onsite on works executed and submit for approval.


### Dashboard and Reporting

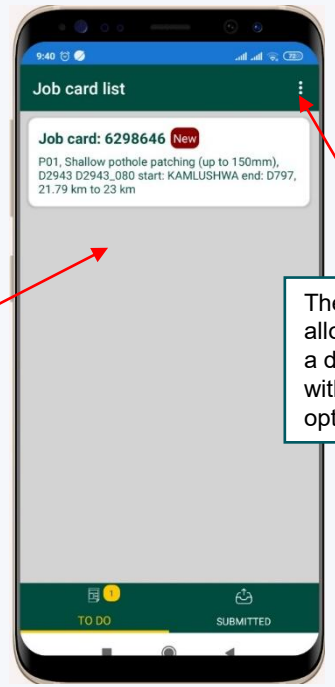
- MMS comes with a dashboard functionality that allows a snapshot of current job cards issued , work done to date , value of work done and utilization of officials etc.
- Multiple reports an also be generated from the system either in pdf form or csv. Format.

# MMS Training and Engagement

# MMS Mobile App

- The MMS software provides an on-the-go option for supervisors to view, approve and submit job cards
- The App is only available on the Android operating system for now
- Mobile phones using the android OS can download the app on the Google Play store

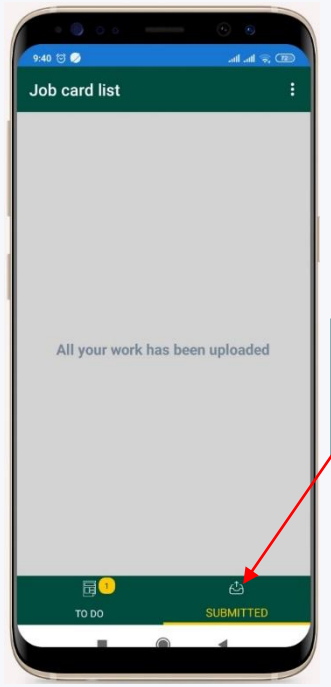
# Using the MMS Mobile App




Here you can view "open job cards" that have been assigned to you on to do page

The three-dot icon allows you to open a drop-down menu with additional options

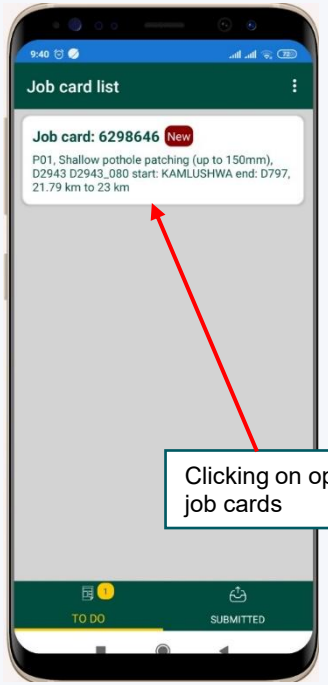

Here you request Job cards, upload job cards and refresh the page




On the submitted tab you can view all submitted job cards for approval

ANDROID APP ON Google play

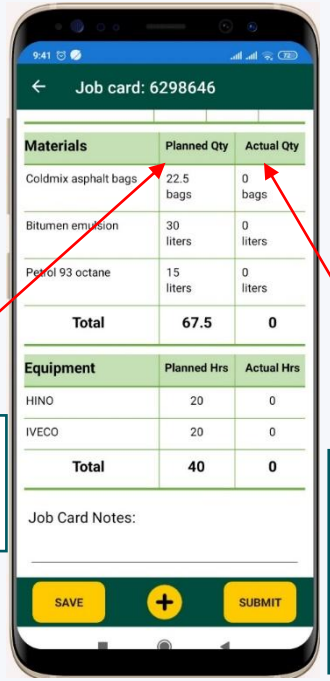
# Completing a Job Card on the App




Clicking on open job cards

Allows you to view activities, materials and equipment as well as, add on, save and submit


Column on left shows planned / estimated quantities.



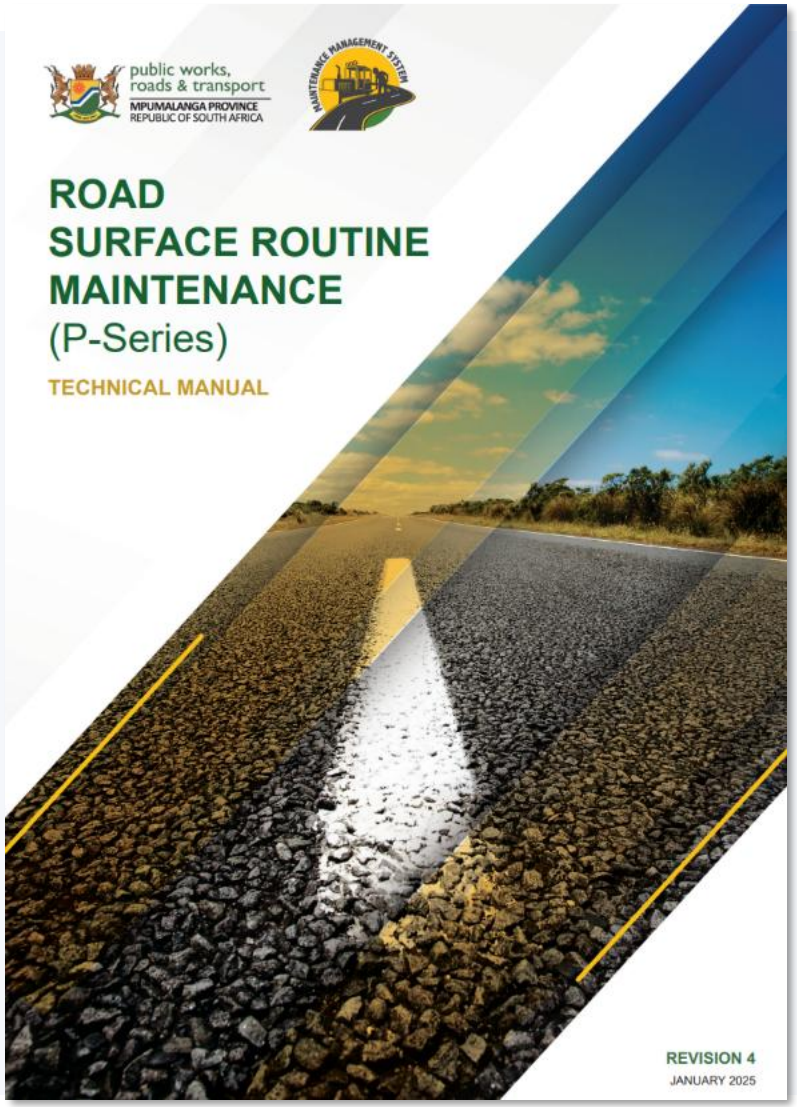

Column on right is for the **Foreman** to fill out based on the actual quantities used !!!

ANDROID APP ON Google play

# On the ground – site works

# Technical Manuals for Maintenance Execution - Adoption Workshops

- P series – Road surface routine maintenance
- G series – Unpaved road routine maintenance
- D series – Drainage maintenance
- S series – Structures maintenance
- R series – Road reserve maintenance
- F series – Traffic facility maintenance



# Technical Manuals for Maintenance Execution - Technical Manual

WORK IDENTIFICATION

## 2. WORKS IDENTIFICATION

Inspections should be conducted on a regular basis to help identify required routine maintenance work across the road network. Outside of conducting regular inspections, the identified failures may also arise in response to complaints by public road users on the unsatisfactory condition of a particular road segment or segments. There are various channels for capturing the complaints i.e. Pothole Reporting Site and MMS- Maintenance Issues function etc.

*Periodic inspections should be planned and performed as one way of identifying maintenance work. Periodic inspections are as such part of the holistic routine road maintenance programme.*

### 2.1 Distresses

**The occurrence of one or more of the following typical defects on the road surface is an indication that shallow patching may be required.**

- Isolated surface failures: surrounding area is still intact.
- Localized stripping or breaking up of the asphalt surfacing; the base not affected.
- Mechanical damage to the surfacing or wearing course.

*Distresses on the pavement are an indication of the deteriorated condition of the road. A focused investigation into the causes of the distresses is crucial for the selection of an appropriate maintenance intervention/activity from the standardised list of maintenance activities.*

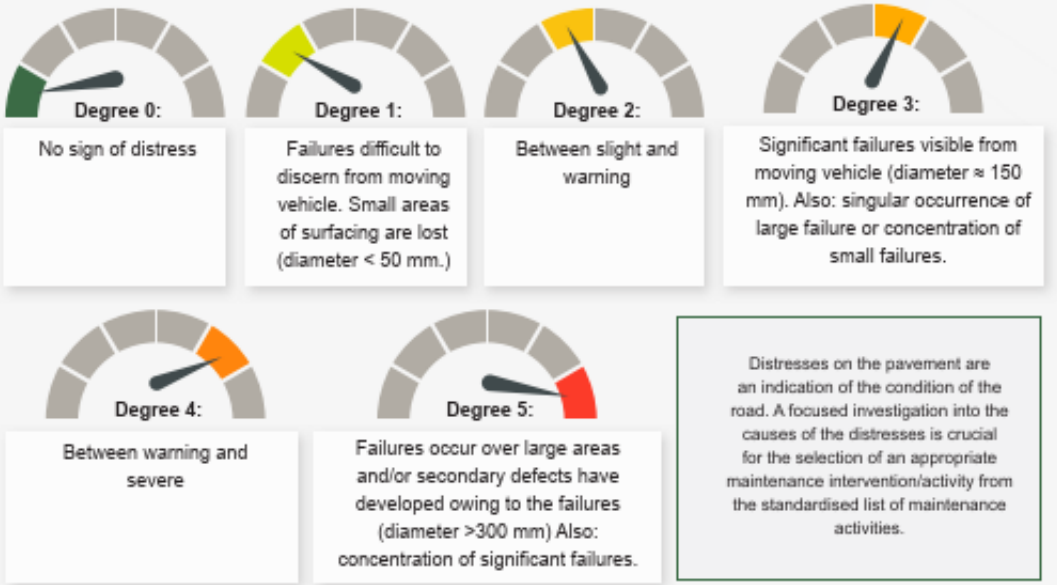
### 2.2 Causes

**The occurrence of the above listed defects is typically caused by:**

- Poor quality bituminous materials used during the construction of surfacing wearing course.
- Infiltration of water into the surfacing wearing course, causing stripping and debonding

Figure 2.1 to the right contains some photographs to assist in clarification of trigger conditions. For extensive shallow patching needs, it is up to the manager to decide on the cost effectiveness of executing the required work through extensive shallow patching. This decision may be assisted by the provision of maintenance policies and maintenance strategies that have been adopted by the organisation.

**Degree ratings are as follows:**




Distresses on the pavement are an indication of the condition of the road. A focused investigation into the causes of the distresses is crucial for the selection of an appropriate maintenance intervention/activity from the standardised list of maintenance activities.

WORK IDENTIFICATION

# Technical Manuals for Maintenance Execution - Technical Manual

DECIDING ON MAINTENANCE INTERVENTION: SHALLOW PATCHING (ACTIVITY P01)

## 3. DECIDING ON MAINTENANCE INTERVENTION: SHALLOW PATCHING (ACTIVITY P01)

**A decision to select shallow patching as an appropriate maintenance intervention is made when surface failures are present on the road, but the underlying base layer has not yet been compromised by traffic or environmental factors. Although surface failures are not classified as potholes in TMH9, the CSIR document, Potholes: Technical Guide to Their Causes, Identification, and Repair, recognizes surface failures as an early indicator for patching, as they often precede the formation of potholes.**

The CSIR Built Environment has developed a comprehensive technical guide for pothole repairs, which includes addressing surface failures. This guide is highly recommended for anyone involved in making technical decisions about repairing potholes and surface failures. It explains the causes, identification methods, and repair procedures, aiming to equip decision-makers with the knowledge to not

Table 3.1 outlines a decision-making process to guide the selection of the most suitable maintenance intervention for shallow patching. This process is adapted from the CSIR document and does not address the following:


| Key | Defect | Repair Action | Go To |
|---|---|---|---|
| 1 | a. Surface failure has exposed an un-stabilized base | | 2 |
| | b. Surface failure has exposed a stabilized base | | 3 |
| | c. Surface failure has exposed a previous seal | | 2 |
| 2 | a. Surface failure is not associated with cracks | Shallow patching – refer P02 | |
| | b. Surface failure is associated with cracks (e.g., crocodile cracking) and deformation | Medium depth or deep patching – refer P04 | |
| | c. Surface failure is associated with cracks but no deformation | Shallow patching refer P02 (and sheet crack sealing - refer P05) | |
| 3 | a. Top of base has carbonated and is weak (with or without deformation) | Deep patching - refer P04 | |
| | b. Top of base has not carbonated excessively and is still strong (no deformation) | Shallow patching – P02 | |
| | c. Top of base has not carbonated excessively but deformation is present | Deep patching – refer P04 | |

Table 3.1: Decision Process for Shallow Patching

DECIDING ON MAINTENANCE INTERVENTION: SHALLOW PATCHING (ACTIVITY P01)

# Technical Manuals for Maintenance Execution - Technical Manual

| PLANT/EQUIPMENT | | |
|---|---|---|
| | No. | Class |
| PLANT | 1 | Truck with amber flashing light |
| | 1 | Compactor / vibratory roller equal to Bomag 90 |
| | 1 | Saw cutter |
| EQUIPMENT | 6 | Picks |
| | 6 | Shovels |
| | 1 | Bass broom |
| | 1 | Prime bucket |
| | 1 | Block brush |
| | 1 | Wooden float |
| | 1 | Metal rake |
| | 1 | Brush |
| | 1 | 2 m Straight edge |
| | 5 | Chalk sticks or lumber Crayons |
| | 2 | Red flags |
| | 6 | Safety vests |
| | | Measuring Wheel |
| | | Hand tampers |
| SIGNS | 2 | Road Workmen |
| | 1 | Road narrows L.H.S. |
| | 1 | Road narrows R.H.S. |
| | 10 | Traffic cones |
| | 2 | Stop / Go control ahead |
| | 2 | Stop / Go control boards |

| MATERIALS | | |
|---|---|---|
| DESCRIPTION | PURPOSE | STANDARD |
| 60% Cationic Spray Grade Emulsion | Priming | SANS 548: 2003 |
| 60% Anionic Spray Grade Emulsion | Priming | SANS 309:204 |
| Diesel | To prevent cold premix from sticking | SANS 342: 2006 |
| Crusher dust | To Prevent Cold Premix stripping | |
| Hot mix asphalt or Cold mix asphalt (premix) | Surface wearing course construction | SANS 3001-AS2, SANS 3001-AS10, SANS 3001-AS11 and SANS 3001:AS20 |
| Course slurry | Surface wearing course construction | |

Table 4.3: Material requirements for a shallow patching team

# Technical Manuals for Maintenance Execution - Technical Manual

SAFE WORK METHOD STATEMENT

## 5. SAFE WORK METHOD STATEMENT

Safety compliance is a very important aspect of road routine maintenance activities. The road repair works will be performed in compliance with the 'Occupational Health and Safety Act, 1993 (No.85 of 1993)'.

As such there are three aspects of safety compliance namely:

Traffic accommodation

## 6. STANDARD METHODS AND PROCEDURES

STANDARD METHODS AND PROCEDURES

### 6.1 Removal of distressed surface layer

The following procedure will be followed for the removal of a distressed surface layer:

- Before starting the repairs check the surrounding areas of the surface failure for debonding. This is best achieved by tapping the surface with a hammer. A dull sound indicates lack of bond, and these must be included in the area to be repaired. Mark out the extent of debonding with the surface failure to be repaired and lift off debonded material adjacent to the failure with a flat spade.
- Typically, isolated repairs are not trimmed to a rectangular

### 6.3 Backfilling (Surfacing)

Either hot or cold mix asphalt (HMA or CMA) or coarse slurry will be used for the construction of surfacing wearing course of the shallow patch.

#### 6.3.1 Surfacing by HMA (Hot Mix Asphalt)

Hot Mix Asphalt (HMA) should be used for construction of the surfacing wearing course, where repair works are of large quantities and thus ordering asphalt from a manufacturer is economically justifiable and logistically practical; including that asphalt can be delivered in temperatures that exceed 140°C.

## 7. QUALITY STANDARDS

QUALITY STANDARDS

There are four aspects of Quality Standards namely:

- material specification (quality of the materials),
- work execution quality control measures,
- equipment performance standards and
- quality standards of completed works (restored condition).

### 7.3 Equipment performance standards

The equipment performance standards address the required performance capabilities of plant/equipment used for repair works. The performance capabilities are as follows:

- Cutting or sawing equipment should be capable of cutting pavement surface layers to depths of 50mm in

## 8. WORK COMPLETION

WORK COMPLETION

### 8.1 Quality Acceptance

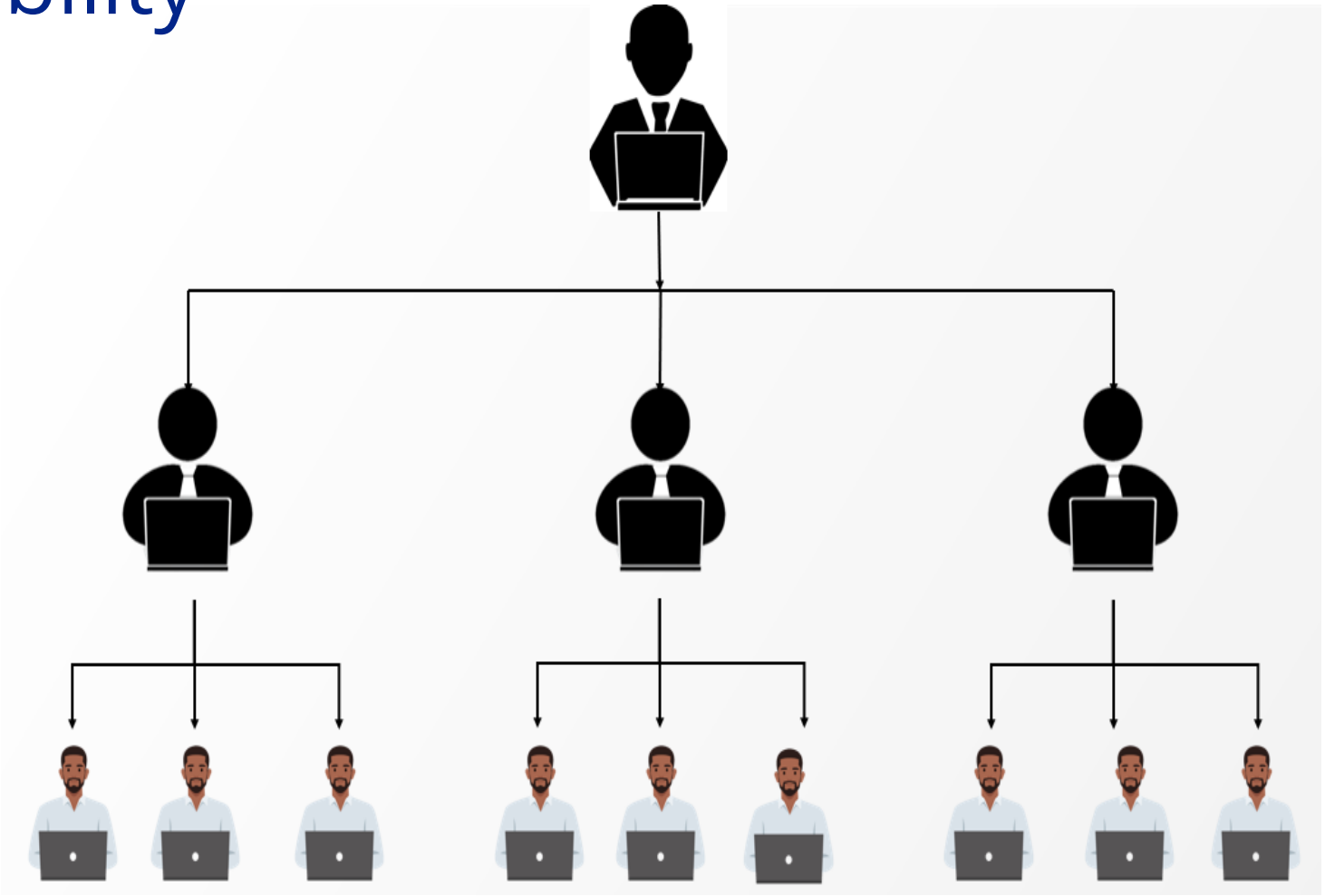
The works can be accepted and signed off by the Senior Foreman/Road Superintendent for quality when it meets all the quality acceptance standards and confirmation of such is made. The job card can thus be finalized.

### 8.2 Quantity Reporting

The final quantity of works to be reported and inputted to the expenditure component of MMS may not necessarily be the same as the initial estimate, as on the job card. Thus, the job card should be finalised, and input with final quantities.

| Activity | | Unit |
|---|---|---|
| **P01** | **Shallow patching** | **m² (sqm)** |

# Maintenance KPI Dashboard – improved visibility



**Head Office Level**

**District Level**

**Cost Centre Level**

# Where to now?

1. The full implementation of the Performance Management System of the CMMS
2. The integration of RAMS with the CMMS cloud-based software platform for the Mpumalanga DPWRT's
3. The integration of SANRAL's Pothole Reporting Site with the Mpumalanga DPWRT's CMMS

Thank you!

Questions?

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