

## MODULE 14

## MANTENANCE TECHNIQUES - MAIN PERIODIC ACTIVITIES

### Objectives

After fulfilling Module 14, you will be able to:

- Comprehend procedures and techniques in implementing some of main periodic activities.
- Comprehend safety issues in rural road maintenance implementation.
- Self - Assessment

### Requirement

The participants are required to have comprehended following modules:

- Module 1: "*Local Road Network*"
- Module 2: "*The Concepts of Rural Road Maintenance*"
- Module 4: "*Rural Road Defects and the Causes*"
- Module 11: "*Rural Road Maintenance Materials*"

### Methodology

- The participants are introduced procedures and techniques in implementing some of the main periodic activities.
- The participants are introduced safety works during road maintenance implementation.
- Self - Assessment

### Training Kit

- Rural Road Maintenance Handbook
- Module 14 "*Maintenance Techniques- Main Periodic Activities*"

### Studying Activities

1. Learn about procedures & techniques to carry out some main activities in periodic road maintenance
2. Learn about safety issues during execution of periodic road maintenance
3. Self - assessment

## 1. Learn about some periodic pavement activities - procedures and techniques

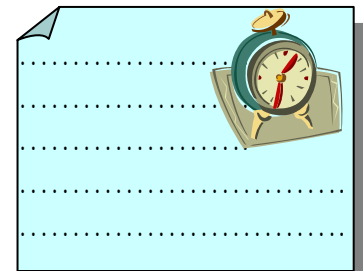
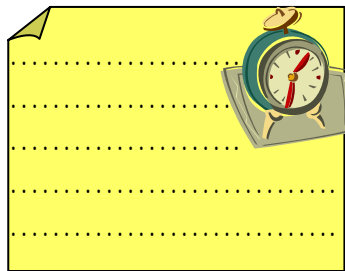


Read again Module 2 "*Concepts of rural road maintenance*". Fill in following boxes the differences between rural road routine & periodic maintenance.

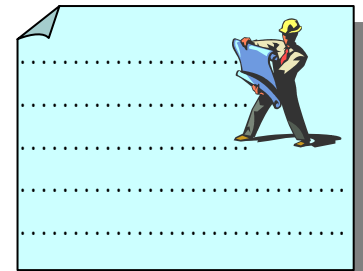
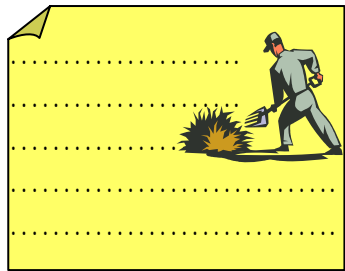
### Periodic Maintenance

### Routine Maintenance

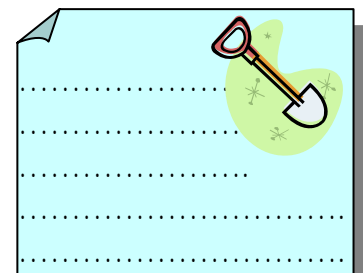
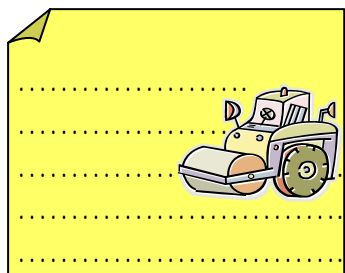
Difference 1



Difference 2



Difference 3



Some typical activities

Some typical activities



Learn about periodic maintenance, activity 1 of : *Re-layer gravel pavement*. See the following figure to know procedures and techniques and fill in the blank with missing information.

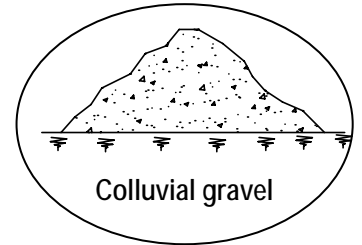


**Step 1  
preparation**

**Material**

Prepare material for gravel pavement reconstruction. The material based on local condition could be:

- **Colluvial gravel**
- .....
- .....



**Tools & Construction Machines**

Tools and construction machines are prepared based on method statement (manually or machinery)

**1. Simple hand-tools**

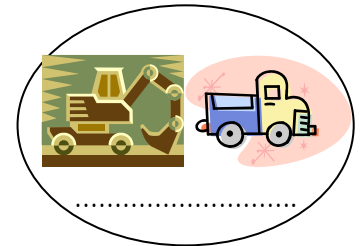
- Hoe, shovel, cart
- Soil-carrying bicycle
- Watering can
- Hammer



Simple hand-tools

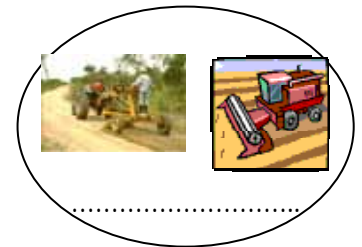
**2. Light mechanical equipments**

- Soil-carrying tractor
- Light grader (modified)
- Hand-held roller



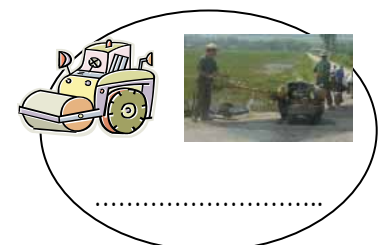
**3. Heavy mechanical equipment (if any)**

- Power-shove
- Truck
- Grader, bulldozer
- Roller
- Watering truck



*\* Manual construction using simple hand-tools and light mechanical equipment*

*\* Mechanical construction using heavy mechanical equipments.*



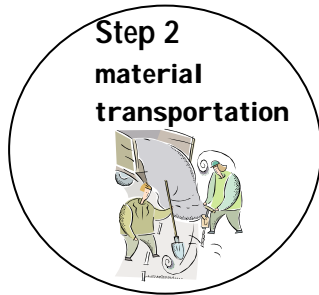
**Defect treatment (See module 12 & 13)**

Check & treat defects of existing pavement before re-layering gravel pavement, such as:

- **Soft spot/settlement treatment**
- **Pothole filling**
- **Embankment slip treatment**
- .....

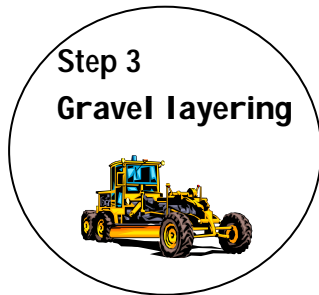
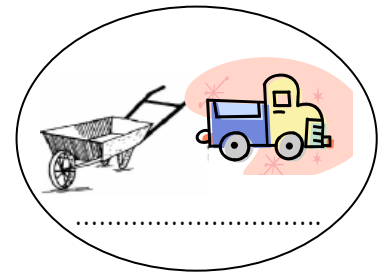


Treat pavement defects before relaying



**Material source nearby site:**  
 Transport gravel using bicycle, cart.

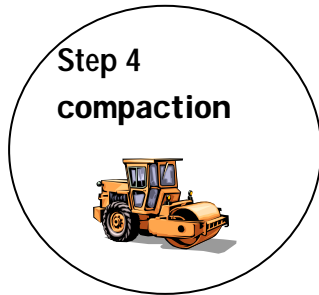
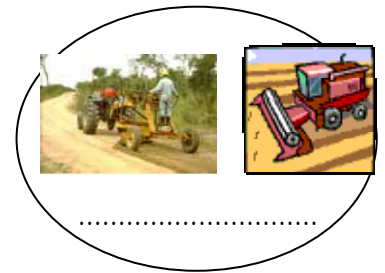
**Material source far from site:**  
 Can transport gravel using bicycle, tractor or track



**Can layer gravel using:**

- Shovel, hoe (manually).
- Light grader (modified)
- Bulldozer

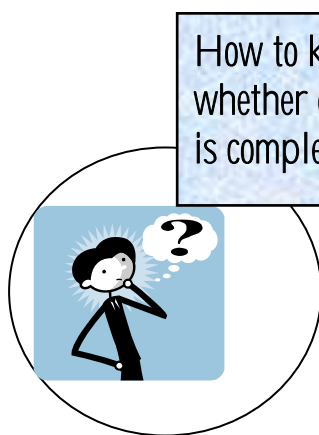
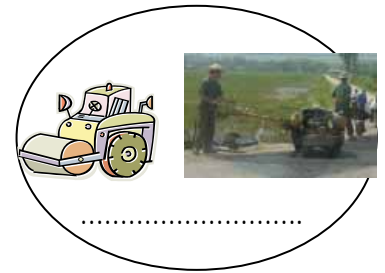
**Note:** Layer gravel evenly & conforming to camber shape. Control optimum moisture during compaction



**Compact gravel using:**

- Light roller (Hand-held roller)
- 6 - 8 ton steel roller

**Note:** Control surface evenness during compaction immediately after some first roller passes.



How to know whether compaction is completed?

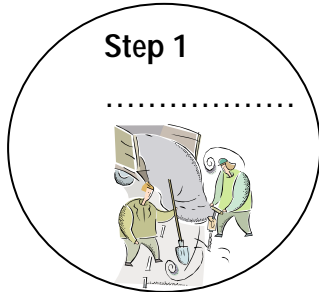
**There are three ways**

**Compaction completed while:**

1. No wavy line observed in front of rolling compactor
2. No wheel mark observed on surface while roller passing
3. Where:  
 H1: un-compacted layer  
 H2: compacted layer  
 If  $H1/H2 \geq 1,3$ : then compaction is completed



Learn about periodic maintenance, activity 2: *Bitumen sealing on damaged bituminous pavement (crocodile cracking, abrasion...)*  
 See following figure to know procedure of single bitumen sealing treatment and fill in following blanks with missing information.

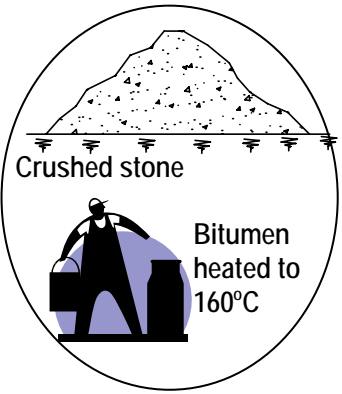


**Step 1**

**Material**

Prepare following materials:

- 0.5x1 cm crushed stone
- 60/70 bitumen
- Prime coat cutback
- Other crushed stone for leveling and/or defect treatment sized 0,5x1cm ; 1x2cm, 2x4cm or 4x6cm.



**Tools and construction machines**

Prepare tools & construction machines as:

**1. Simple hand-tools**

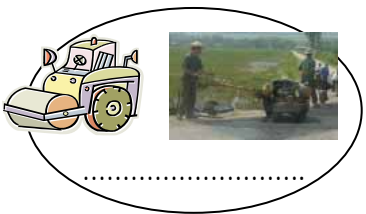
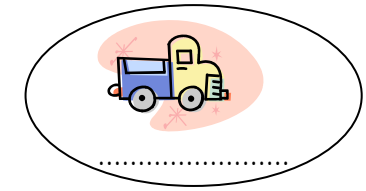
- Brush
- Hoe, shovel, wheelbarrow
- Steel round tray (to spread chippings by hand)
- Heating bitumen tank
- Bitumen spraying can
- Steel dipper

**2. Light mechanical equipment**

- Tractor
- Hand-held roller

**3. Heavy mechanical equipment (if any)**

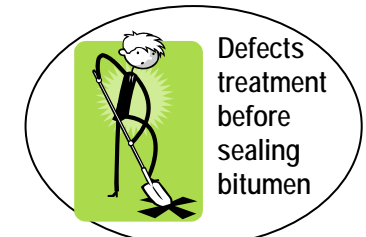
- Compressed air machine
- Track
- Roller

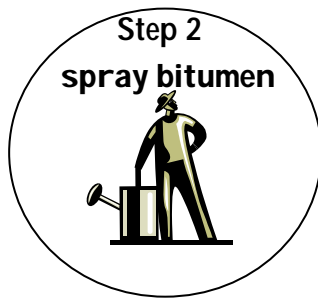


**Defect treatment** (See module 12 & 13)

Check & treat defects of existing pavement before sealing, such as:

- **Soft spot/settlement treatment**
- **Pothole filling**
- **Embankment slip treatment**
- **Leveling**
- **Clean the pavement by sweeping**





**Heat bitumen to 160°C**

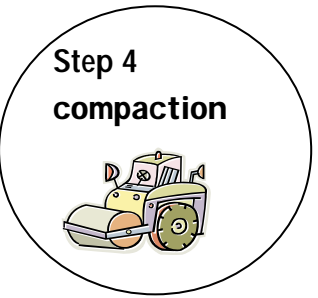
Pour heated bitumen to spraying can using steel dipper, then spray bitumen on surface at the rate of 1.2kg/m<sup>2</sup>

Note: should spray bitumen evenly



**Spread 0.5x1cm chipping using steel tray.**

- Spread chippings immediately after spraying heated bitumen
- Cover surface evenly and widespread by tripping
- Application rate is 10-12 liter/m<sup>2</sup>



**Can compact using:**

- Hand-held roller
- 6 - 8 ton steel roller

Note: Compact immediately after spread chippings



Double & three time bitumen sealing procedures:

- Preparation work is the same as for single bitumen sealing above.
- Repeat twice or three time: spray bitumen + spread chippings + compact (steps 2+3+4) conforming to rates in following table 14.1:

Table 14.1

Types	Thickness (cm)	Bitumen		Crushed stone		
		Spraying order number	Rate (kg/m <sup>2</sup> )	Spreading order number	Tripping sized (mm)	Rate (liter/m <sup>2</sup> )
SBST	1.0	Once	1.2 (*)	Once	5/10	10-12
	1.5	One	1.5	One	10/16	15-17
DBST	2.0 - 2.5	1 <sup>st</sup>	1.5	1 <sup>st</sup>	10/16	14-16
		2 <sup>nd</sup>	1.2	2 <sup>nd</sup>	5/10	10-12
TBST	3.0 - 3.5	1 <sup>st</sup>	1.7	1 <sup>st</sup>	16/20	18-20
		2 <sup>nd</sup>	1.5	2 <sup>nd</sup>	10/16	14-16
		3 <sup>rd</sup>	1.1	3 <sup>rd</sup>	5/10	9-11

*Note: (\*) single bitumen sealing only is applied on low traffic road*

## 2. Learn about safety during implementation of road maintenance activities



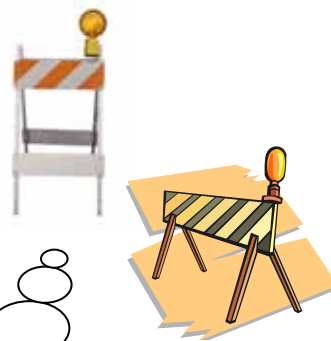
"Construction site" signs should be located at starting & finishing of maintained road section to warn road user to reduce speed for traffic safety.



Signs could be made by yourself using fiver-board, wood, or iron in local condition

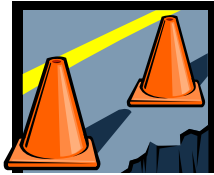


Should use other traffic safety facilities during implementation of rural road maintenance activities



*Flasher light* should be arranged at culvert, man hole... during implementation of maintenance activities at night

Frame could be made by yourself from wood and normal light can be used



Construction cones are located along road section of maintenance site

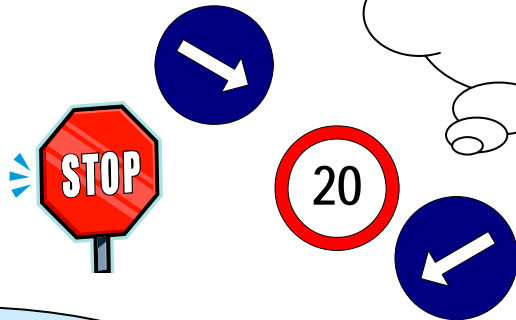
You can make construction cone from steel plate, even old bucket and paint



Road-block fence should be located in front of maintenance site

It could be made by yourself from wood

They can be made by yourself from fiberboard, wood, or iron...



Other traffic signs are located in suitable places





Look at the sample below of traffic safety arrangements at maintenance site of bitumen sealing



Industrial, occupational safety and hygiene in general should be ensured at maintenance site

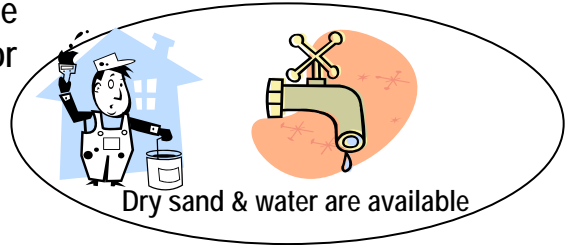
Workers should be supported with working safety facilities while implementing bituminous works

Labor safety facilities:

- Gloves
- Rubber boots
- Comforter
- Working safety clothing



Firefighting equipment as dry sand tank, water tank... should be available on maintenance site. Plan of firefighting & First Aid should be prepared for case of fire and for burned victim



Dust and deposal materials should be cleared & remove from pavement, culverts, drains... Bitumen should be cleared from structures, trees... along road



**Kiểm tra - Danh gia**

**Assessment**

1. Strike though (~~xxxxx~~) the wrong steps of double bitumen sealing treatment and fill the right order numbers in boxes on the right

a)	Watering existing pavement before sealing bitumen	<input type="checkbox"/>
b)	Treat defects	<input type="checkbox"/>
c)	Prepare materials & construction tools and machines	<input type="checkbox"/>
d)	1 <sup>st</sup> chipping spread at rate of 14 - 16 liters/ m <sup>2</sup> using steel round tray	<input type="checkbox"/>
e)	Heat bitumen to 60°C	<input type="checkbox"/>
f)	1 <sup>st</sup> bitumen spraying at ratio of 1.5 kg/m <sup>2</sup> using spraying can	<input type="checkbox"/>
g)	Make the 1 <sup>st</sup> compaction widespread pavement surface using 6 - 8 tons roller	<input type="checkbox"/>
h)	Make the 2 <sup>nd</sup> bitumen spraying at rate of 1.2 kg/m <sup>2</sup> using spraying can	<input type="checkbox"/>
i)	Make the 2 <sup>nd</sup> 5 - 10 mm chipping spread at rate of 10 - 12liters/m <sup>2</sup>	<input type="checkbox"/>
k)	Make the 2 <sup>nd</sup> compaction using 6 - 8 tons roller	<input type="checkbox"/>

m)	Wait for bitumen to cool, then spread chipping	
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Good

Not good

*3. Write in the following line names of necessary safety facilities during soft spot treatment in residential area in two days*

.....

.....

.....

.....

.....

.....

.....

Good

Not good