

Section 2

S2.1: The Routine Maintenance 1 The Routine Maintenance 2

SUMMARY

Descriptions of LVRR defects and the appropriate practical measures and activities (Routine maintenance 1 and 2) applicable for fixing them



Maintenance 1 & 2

LVRR Routine maintenance 1



Defect 1 – Vegetation growth excessive on road shoulders, structures or affecting drainage system, visibility and safety for traffic and people.

Maintenance Activity 1 – Control vegetation: bush/tree clearing & grass cutting and disposal



LVRR Routine maintenance 1

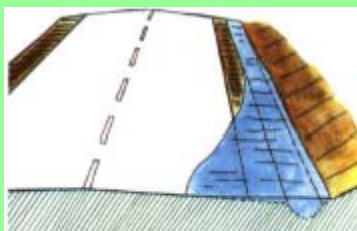


Defect 2 –
Side or turn-out drains silted or blocked by debris.

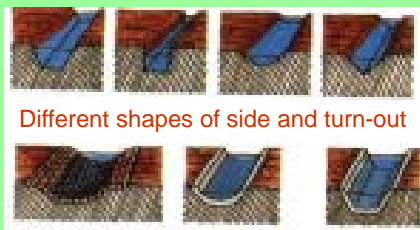
Maintenance Activity 2 – Clean debris/silt from side ditch & turnout drain



LVRR Routine maintenance 1



Defect 3 – Water ponds on road or side of road because side or turn-out drains have not been provided or side or turn-out drains are damaged.

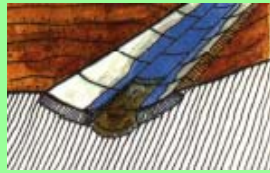


Different shapes of side and turnout

Maintenance Activity 3
Construct new drains or reconstruct side & turnout drains



LVRR Routine maintenance 1

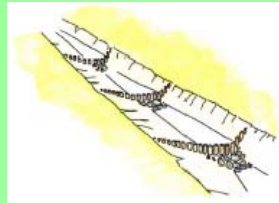


Local defect in side drain

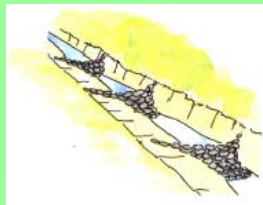


Use suitable local materials for the repairs.

Defect 4 – Drains damaged or eroded



Scour checks reduce water velocity on steep drains to prevent erosion.



Maintenance Activity 3

Repair damaged drains



LVRR Routine maintenance 1



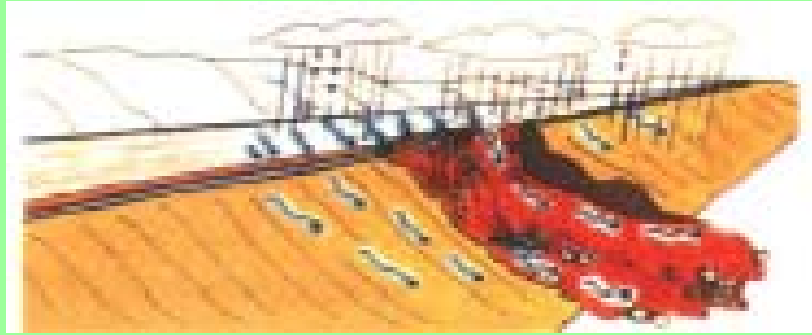
Defect 5 – Debris or silt in or close to culvert outlet

Maintenance Activity 5
– Clean debris/silt from culverts.



LVRN Routine maintenance 1

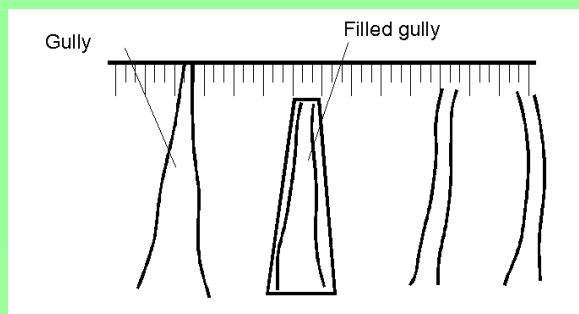
Defect 6 – Slip on embankment



Maintenance Activity 6 – Refill embankment Slip



LVRN Routine maintenance 1



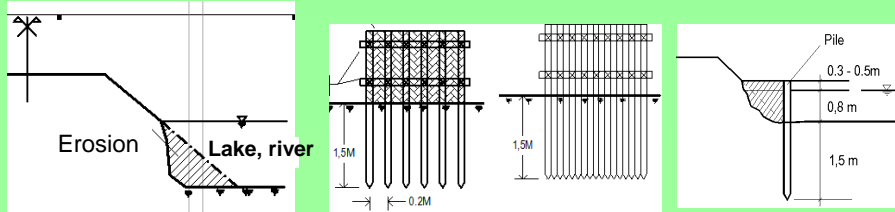
**Defect 7 –
Erosion on fill
or cut slope**

Maintenance Activity 7 – Refill slope gully



LVRN Routine maintenance 1

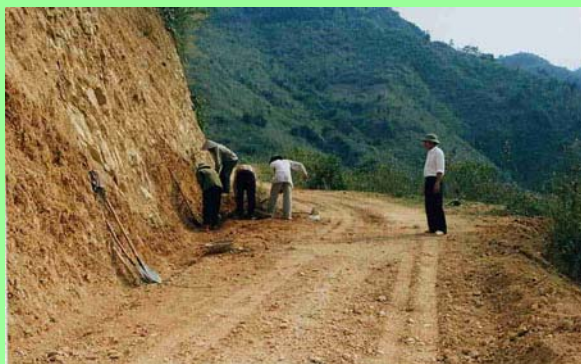
Defect 8 – Embankment toe scoured by waterway or water traffic. This defect is a common occurrence in Mekong delta



Maintenance Activity 8 – Repair waterway scour



LVRN Routine maintenance 1



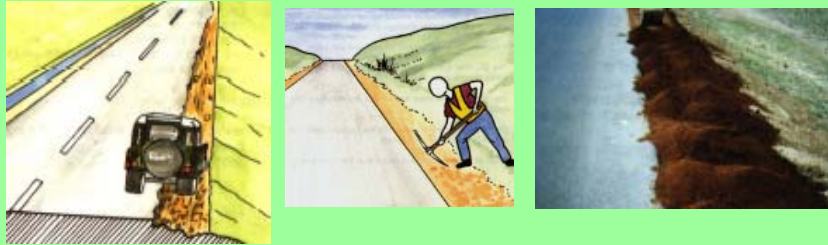
Defect 9 – Minor landslide on to the road

Maintenance Activity 9 – Remove small landslide



LVRN Routine maintenance 1

Defect 10 – does not drain water away from road surface, or is eroded



Maintenance Activity 10 – Reshape/replenish shoulder surface material



LVRN Routine maintenance 1

Defect 11 –
Debris or
waste on road
surface



Maintenance Activity 11 – Clean road surface



LVRR Routine maintenance 1

Defect 12 – Dirt or debris on bridge surface, bridge drains are blocked.

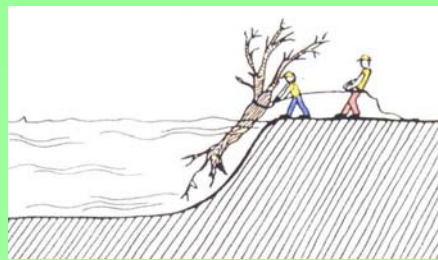
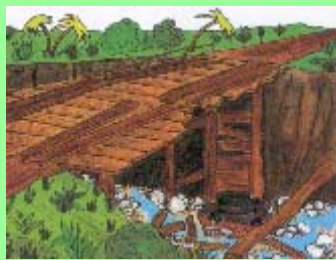


Maintenance Activity 12 – Clean channel & bridge surfaces



LVRR Routine maintenance 1

Defect 13 – Debris, logs or timbers blocked the channel under bridge or on causeway



Maintenance Activity 12 – Clear bridge or causeway opening



LVRP Routine maintenance 1

Defect 14 – Dry and dusty surface



Maintenance Activity 14 – Spray water



Maintenance 1 & 2

LVRP Routine maintenance 1



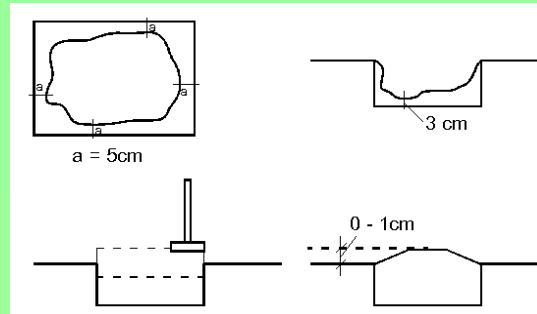
Defect 15 – Road furniture:
Traffic signs are dirty or covered by vegetation

Maintenance Activity 15 – Clean signs, cut trees or plants that cover the signs



LVRR Routine maintenance 1

Defect 16 – Potholes (earth/gravel/stone macadam /brick road) .



Pothole filling on earth and gravel road

Maintenance Activity 16 – Fill potholes (earth or gravel or stone macadam road)



LVRR Routine maintenance 1



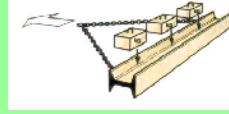
Defect 17 – Soft spots or local depression on gravel or stone macadam road

Maintenance Activity 17 – Repair ponding or soft spot



LVRR Routine maintenance 1

Defect 18 – Road surface corrugated – unpaved road



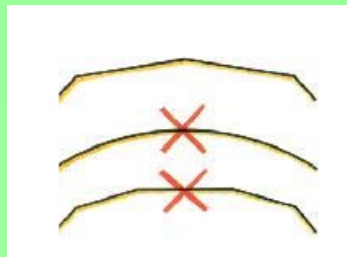
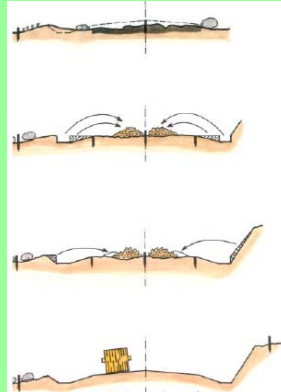
Steel I beam
(400mm depth
section) drag. Can
be surcharged to
increase weight if
necessary

Maintenance Activity 18 – Remove corrugations



LVRR Routine maintenance 1

Defect 19 – Road surface does not drain to the edge of the road



Correct camber

Incorrect
camber

Incorrect
camber

Maintenance Activity 19 –
Reshape road camber (by
labour)



LVRR Routine maintenance 2

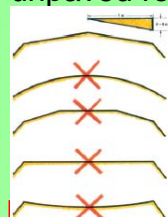
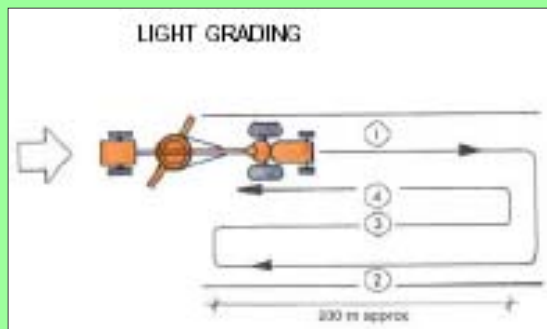
- Procedures and techniques to implement some activities of Routine Maintenance 2: These activities may require skills, materials or equipment to be brought in.



LVRR Routine maintenance 2



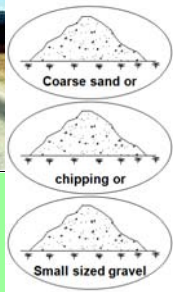
Defect 20 – Road surface pot-holed or poor camber – unpaved road



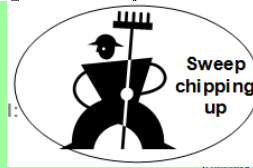
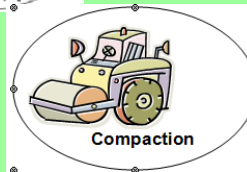
Maintenance Activity 20 – Reshape road camber (by equipment)



LVRR Routine maintenance 2



Defect 21 –
Bleeding of bituminous pavement reduces skid resistance



Maintenance Activity 21 –
Spread evenly on pavement at bleeding area

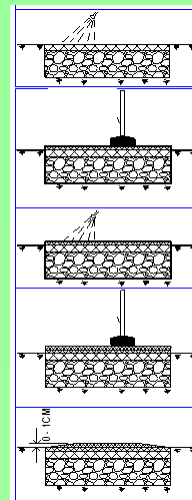
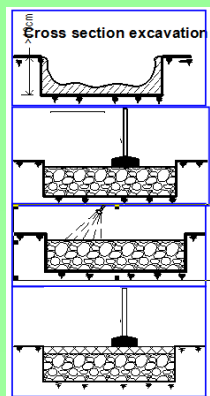


LVRR Routine maintenance 2

Defect 22 – pothole filling procedure (in large area)



Maintenance Activity 22 – to complete pothole on bitumen sealing surface



LVRR Routine maintenance 2

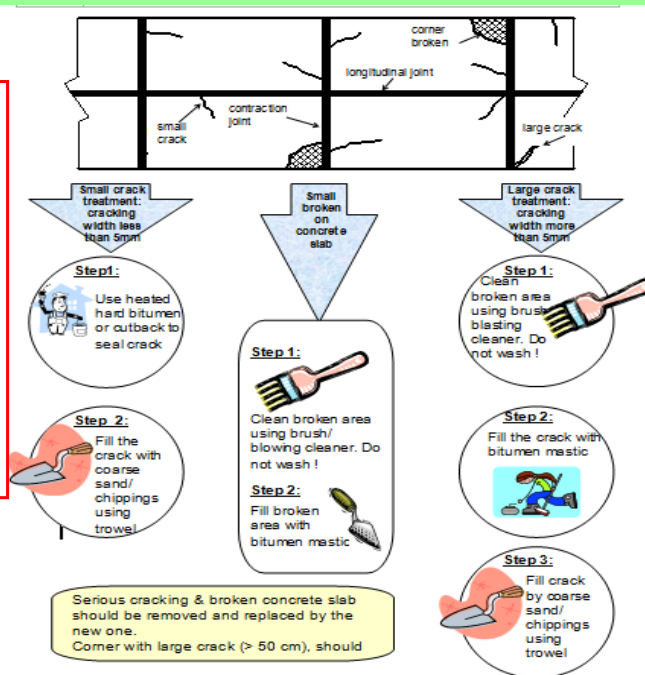
Defect 23 – Damage to concrete pavement usually takes the form of cracking and broken slab edge and/or corner

Maintenance Activity 23 – Fill the crack with coarse sand/ chippings using trowel, bitumen mastic

↓ (be continued)

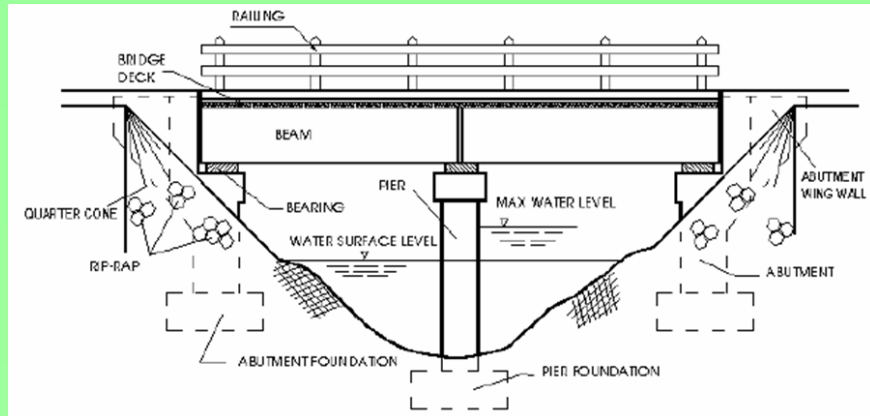


Maintenance Activity 23 – Fill the crack with coarse sand/ chippings using trowel, bitumen mastic



LVRR Routine maintenance 2

Defect 24 – Drainage structures such as bridges, culverts... are often eroded due to water flow



LVRR Routine maintenance 2

Maintenance Activity 24a – Repair quarter cone erosion

Step 1: Clear erosion area: remove rocks & excavate all soft soil.



Step 2: Refill using suitable soil and compact.

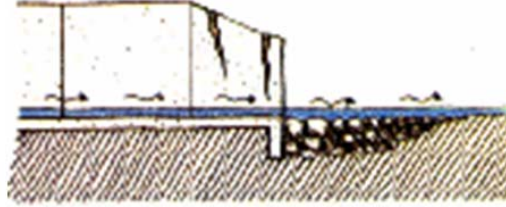


Step 3: Rebuild quarter cone using masonry with 100# cement mortar



LVRR Routine maintenance 2

Maintenance Activity 24b – Repair eroded outlets/inlets



Step 1:

Work should be done in dry season. Prepare construction site, hold back the stream to repair culvert inlet

Step 2:

Excavate damaged inlet

Step 3:

Refill aggregate with high depth of excavation. Compact to required density

Step 4:

Rebuild culvert inlet using masonry with 150# cement mortar

Note: Extend inlet area using masonry or rock paving in case of erosion extension outside culvert inlet.



Maintenance 1 & 2

SUMMARY OF MAINTENANCE ACTIVITIES

M1

1. Control vegetation
2. Clean debris/silt
3. Construct/reconstruct drains
4. Repair damaged drains
5. Clean debris/silt from culverts
6. Refill embankment Slip
7. Refill slope gully
8. Repair waterway scour
9. Remove small landslide
10. Repair waterway scour
11. Reshape shoulder
12. Clean road surface
13. Clean channel & bridge surfaces

M2

14. Clear bridge/causeway opening
15. Spray water
16. Clean signs
17. Fill potholes
18. Repair ponding
19. Remove corrugations
20. Reshape road camber
21. Reshape road camber (with equipment)
22. Spread bleeding area
23. complete pothole
24. Fill the crack
25. Repair drainage structures
26. Repair quarter cone erosion
27. Repair eroded outlets



Key Note

- ❑ Water must be shed from the road as soon as possible. Sufficient drainage should be checked, provided.
- ❑ Costly anti-erosion building and lining to side drain should be carefully considered to apply only to appropriate drain sections.
- ❑ Maintenance activities should be carried out in accordance with known methods and procedures to ensure work quality



Section 2

S2.2: Material for LVRR maintenance

SUMMARY

Specification descriptions and practical uses of common materials for maintenance of:

1. Earth, gravel and crushed stone roads
2. Bituminous pavement
3. Road structures





S2.2: Material for LVRR maintenance



MATERIAL? For

S2.2: Material for LVRR maintenance

1

Earth, gravel and crushed stone roads

- Soil
- Gravel
- Crushed stone

2

Bituminous pavement

- Asphalt concrete
- Bitumen sealing
- Bitumen penetration

3

Road structures

- Cement
- Mortar
- Cement concrete



1 Material for earth, gravel and crushed stone roads

Local Soil

Some commonly used soil for sub-grade filling:

- ❑ Soil mixed with colluvium, laterite.
- ❑ Sandy soil.
- ❑ Clayey soil.
- ❑ Soil mixed with sand.



1 Material for earth, gravel and crushed stone roads

Local Soil

The following soils can be also be used for some activities :

- ❑ Clay
- ❑ Sand (coarse sand, fine sand)
- ❑ Rubble mixed with soil



1 Material for earth, gravel and crushed stone roads

Local Soil

The following soils are **not allowed** to be used:

- ❑ Salty soil
- ❑ Wet plastic (muddy) soil.
- ❑ Highly organic soil (with vegetation)



1 Material for earth, gravel and crushed stone roads

Soil: usability remarks

No.	Types of soil	For refilling earth road bed and road surface		
		The commonly used soil (++)	The usable soil (+)	Soils that are not allowed to use (-)
1	Sandy clay (more clay, less sand)	++		
2	Clayey sand (more sand, less clay)			
3	Sandy clay mixed with laterit			
4	Clayey sand mixed with laterit			
5	Clay		+	

12	Muddy soil			
13	Humus (with many grass roots and wastes)			



1

Material for earth, gravel and crushed stone roads

NOTE

- ❑ Local soil is an important material in constructing and maintaining rural road. There are many types of soil, *however, and not all* of them can be used for road maintenance
- ❑ Material must **not** be used which will cause road deterioration



Poor maintenance materials causing gravel surface deterioration to earth condition



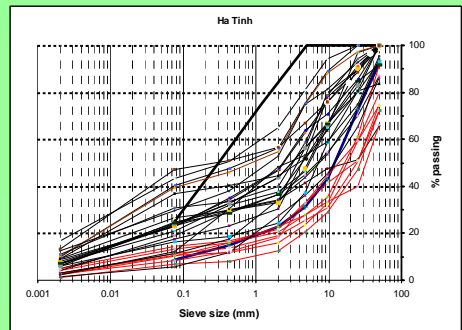
1 Material for earth, gravel and crushed stone roads

Natural gravel

Types of gravel	Place where gravel is available	Features	Construction Requirements
Alluvial gravel	Rivers or streams in mountainous areas	Mix of pebble and sand Without plastic clays.	<ul style="list-style-type: none"> - Remove over sized pebble. - Add more clays to increase plasticity and make it easy to compact
Laterite	Hills in midland region	<ul style="list-style-type: none"> - Red - brown color. - Formed by dark brown laterites in different sizes. - Include a lot of clays. 	<ul style="list-style-type: none"> - Reduce clays. - Used at appropriate moisture
Colluvial gravel	Rolling terrain in mountainous and midland areas	<ul style="list-style-type: none"> - Yellow or bright brown color - Include a lot of pebbles and clays. 	<ul style="list-style-type: none"> - Reduce clays (if clay content is high). - Used at appropriate moisture

Natural gravel

Key issues are **plasticity** and **grading**



1

Material for earth, gravel and crushed stone roads

Crushed stone: Basic requirements

- ❑ Sufficient strength
- ❑ Appropriate size
- ❑ Good shape (No too many flaky chippings)
- ❑ Clean chippings
- ❑ Abrasion value should not be too high



2

Material for Bituminous pavement

Bitumen: for LVRR maintenance

- ❑ Bitumen sealing and bitumen penetration are most popular in Rural Road Network.
- ❑ Hard bitumen with penetration 60/70 is commonly used in constructing **bitumen sealing and bitumen penetration**
- ❑ **Bitumen emulsion** is now also being used



2

Material for Bituminous pavement

Bitumen: Basic requirements

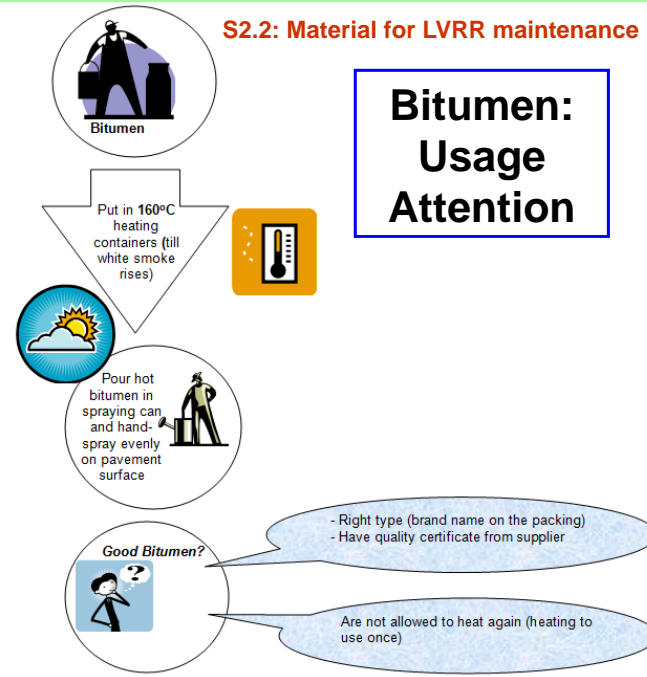
- ❑ Good adhesion to stone
- ❑ Penetration at 25oC is 60 – 70o (0.1mm)
- ❑ Elongation at 25oC is 100cm (minimum)
- ❑ Soften point is 46 - 55oC
- ❑ Flash point is 230oC (minimum)



2

Material for Bituminous pavement

Bitumen: Usage Attention



3 Material for road structures

Cement: for RR repair and maintenance

- ❑ Cement-grade 200 (PC20)
- ❑ Cement-grade 300 (PC30)
- ❑ Cement-grade 400 (PC40)

Good cement?

- Having recognized brand name
- In bags
- Cement particles are soft, fine and do not curdle
- Not in store for a long time



3 Material for road structures

Cement: Usage



Cement



Crushed stone

Coarse sand

Fine sand

Lime

Water



3 Material for road structures

Cement Mortar: Usage

Cement mortar is commonly used for Rural Road Maintenance, specifically as follows:

- ❑ To repair drain system such as building and lining.
- ❑ To repair culverts such as building and plastering apron, head wall, wing wall or crack sealing.
- ❑ Repair bridges such as building, jointing, lining and plastering the quarter cone...
- ❑ Repair/reinforce retaining wall



3 Material for road structures

Cement Mortar: types

Mortar is classified by binder type and by function.

By binder type:

- ❑ Lime mortar comprising lime, sand and water.
Cement mortar comprising cement, sand and water
- ❑ Mixed mortar comprising lime, cement, sand and water

By function:

- ❑ Building mortar: used to bind bricks, stones together into a block
- ❑ Surfacing mortar: used to surface the structure.



3

S2.2: Material for LVRR maintenance

Material for road structures

Cement Mortar: Attention

Good mortar?



Soft and liquid
No segregation
Good adhesion to bricks & stones

- Sufficient Strength
+ Appropriate compression strength.
+ Appropriate components, good material of components



3

S2.2: Material for LVRR maintenance

Material for road structures

Cement concrete: types

Cement concrete quality is based on:

- Chippings used
- Sand
- Cement
- Water

Clean?

Weight?

Size?

???

% ?



Group Discussion

Group Discussion : Maintenance procedures in practice

Each Group to discuss routine maintenance activities and then list their top 5 priorities and explain their selection.

