

# QUANG NGAI RURAL DEVELOPMENT PROGRAM (RUDEP) - PHASE 2

## Operation and Maintenance Manual for Commune Infrastructure: Training Modules



**VIETNAM-AUSTRALIA**

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# 1 Module 1: Develop and Establish a Maintenance System of Commune Assets

## 1.1 Establish Asset Records

### 1.1.1 Complete the Asset Record Form

#### Buildings

##### 1. Description

Select a short but accurate description of the building that will be readily understood by the people using the system. The function or use of the building is probably the most appropriate description. The functional description may need to be augmented with another description to differentiate buildings of similar function eg North pump shed. If assets are numbered this information should be provided in the description. A numbering system may be essential if the records are to be computerised.

##### 2. Sector

The definition of sectors should be undertaken considering local conditions and characteristics. This information is not mandatory. If there is little benefit gained from registering sector the information can be omitted.

##### 3. Location

The description of the location should clearly and unambiguously identify the location of the asset. There are many ways to specify location. Examples of different ways of specifying location include: bearing and distance from a landmark eg 200 metres north of the clinic; distance along a linear asset, eg 150 metres from the start of a canal.

##### 4. Total Area

The total enclosed area of the building should be recorded. The area of each floor should be included rather than just the area of the building footprint. A unit of measurement understood by the community should be used. The required accuracy of the information should be assessed. The total area should equal the sum of all the spaces defined and recorded on the form.

##### 5. Roof type

The roof type relates to both the shape of the roof and the material used. Common forms of roof types include skillion, flat, curved or peaked. Types of roof materials include thatched straw, tiles (wood, clay, concrete) or corrugated iron. Corrugated iron can be galvanised, painted, powder coated or plastic coated.

##### 6. Roof Area

To ensure consistency, irrespective of shape of the roof, roof area should be measured in plan view.

## 7. Gutters

The configuration of the gutters and the type of construction materials shall be recorded. Possible gutter configurations include box gutter and eave mounted gutter. Types of material used include plastic or metal. Describe the coating used on metal gutters and if possible the type of plastic used. The total length of gutters by material and the presence and length of down-pipes should also be noted.

## 8. Space area

A space is defined as a physically identifiable part of the building. The most obvious space is a room but a corridor, built in cupboard or verandah could also be defined as a space. The total area of the Spaces in a building is the total area of the building. The area of a space should be recorded to the closest square metre only.

## 9. Ceiling

Record the type of structure, height to floor, finish and materials used to construct the ceiling. Any gaps or special features should be recorded. Be sure to record if the area of the ceiling differs from the area of the space.

## 10. Windows

Record number of windows, the material used in the frames, the type of window opening, type of latches or locks, dimensions of each frame and the presence of glass or shutters.

## 11. Door

Record the number of doors, type of construction, number and type of hinges, type of latches and locks and dimensions (width and height).

## 12. Wall

Record the type of construction (timber studs, blockwork, bricks), dimensions (width, height, area), type of cladding facing the space. Summarise quantities by type of construction.

## 13. Lights

Record the number, type of fittings, globe type and size.

## 14. Power outlets

Record the number and type of power outlets.

## 15. Plumbing

Record the number and type of plumbing fixtures including the material used to construct each fixture and dimensions.

## **Water Filter**

### 1. Sector

Record if the water filter serves individual households, community water supply or serves special community facilities like health, law and justice, education or child care.

## 2. Location

The description of the location should clearly and unambiguously identify the location of the asset. There are many ways to specify location. Examples of different ways of specifying location include: bearing and distance from a landmark eg 200 metres north of the clinic; distance along a linear asset, eg 150 metres from the start of a canal.

## 3. No of dwellings served

Record the number of dwellings, and if possible the number of persons served.

## 4. Water source

Describe the source of water feeding the filter.

## 5. Type of process

Describe the process used to filter the water and the key dimensions of the filter. Key dimensions relate to the capacity of the storage tanks, size of the filter mechanism and the overall dimensions of the structure.

## 6. Construction material

Record the type of material used in the construction of the filter. Include the type of rust protection used.

# Electricity Reticulation

## 1. Description

Describe the type of electrical item. Commonly found types include, reticulation poles, transformers, insulators, circuit breakers and cables. If available, record any identifying numbers.

## 2. Sector

This is optional and can be used to record the sector eg health, education etc, as well as groupings or divisions within the community.

## 3. Location

The description of the location should clearly and unambiguously identify the location of the asset. There are many ways to specify location. Examples of different ways of specifying location include: bearing and distance from a landmark eg 200 metres north of the clinic; distance along a linear asset, eg 150 metres along a cable run.

## 4. Total length

Record the overall dimension of the asset. For cables this will be the length of cables.

## 5. Number of phases

Record the number of electrical phases the asset employs. A technical specialist should complete this information.

## 6. Type and dimensions of asset

An electrician should record technical information on the specification of the asset.

## Roads

### 1. Description

Provide a description of the road that clearly defines the road. Include any reference number or identifying number that is available.

### 2. Sector

This is optional and can be used to record the sector eg health, education etc, as well as groupings or divisions within the community.

### 3. Location

The description of the location should clearly and unambiguously identify the location of the asset. There are many ways to specify location. Examples of different ways of specifying location include: bearing and distance from a landmark eg 200 metres north of the clinic; distance along a linear asset, eg 150 metres along a road.

### 4. Total length

Record the overall dimension of the asset. For roads this will be the length of the road.

### 5. Maximum longitudinal gradient

Record the maximum slope of the centerline of the road, and the distance the slope continues. Slope is measured as a ratio.

$$\text{Slope} = \frac{\text{Vertical Rise/Fall}}{\text{Horizontal Distance}} \times 100 \%$$

### 6. Number of lanes

Record the number of traffic lanes. A traffic lane should be at least 2.25 metres wide. For example if the carriageway is 5 metres wide the road has two traffic lanes.

### 7. Pavement

Record the type of pavement used the thickness/description of each layer. Pavement types: bound gravel, unbound gravel, macadam, bituminous surface treatment, asphaltic concrete, Portland concrete. Individual roads should be defined so they have only one type of pavement. Subdivide a road into sub sections based on the type of pavement.

### 8. Floodways

Record the water area, key dimensions and type of construction of individual floodways. Type of construction should detail the type of materials used and details of the structural elements. Record the location of each floodway and provide an identification system so individual records are kept for each floodway.

### 9. Culverts

Record the number, size and length of each culvert orifice, details of inlet and outlet structures and channels. Type of construction should detail the type of materials used and details of the structural elements. Record the location of each culvert and provide an identification system so individual records are kept for each culvert.

## 10. Road furniture

Road furniture includes sign posts, safety barriers, distance markers etc. Record the details of the items, dimensions etc. Record the location of each item and provide a identification system so individual records are maintained.

## Bridges

### 1. Description

Provide a description of the bridge that clearly defines the item. Include any reference number or identifying number that is available.

### 2. Sector

This is optional and can be used to record the sector eg health, education etc, as well as groupings or divisions within the community.

### 3. Location

The description of the location should clearly and unambiguously identify the location of the asset. There are many ways to specify location. Examples of different ways of specifying location include: bearing and distance from a landmark eg 200 metres north of the clinic; distance along a linear asset, eg 150 metres along a road.

### 4. Type of construction

Record the structural system and materials used in the construction of the bridge deck and abutments. Provide key dimensions of each component of the structure eg number and length of each span, width of the deck, height above bed of waterway.

### 5. Ultimate design load

Obtain and record the ultimate and safe working loads used by the Bridge Designers when designing the bridge.

### 6. Number of lanes

Record the number of traffic lanes. A traffic lane should be at least 2.25 metres wide. For example if the bridge is 5 metres wide it has two traffic lanes.

### 7. Scour protection.

Record the details of construction, key dimensions and materials used in any scour protection systems. Key dimensions include the area, width, thickness and length.

### 8. Road furniture

Road furniture includes sign posts, safety barriers, distance markers etc. Record the details of the items, dimensions etc. Record the location of each item and provide a identification system so individual records are maintained.

## **Irrigation Systems**

### **1. Description**

Provide a description of the irrigation asset that clearly defines the item. Include any reference number or identifying number that is available.

### **2. Sector**

This is optional and can be used to record the sector as well as groupings or divisions within the community.

### **3. Location**

The description of the location should clearly and unambiguously identify the location of the asset. There are many ways to specify location. Examples of different ways of specifying location include: bearing and distance from a landmark eg 200 metres north of the clinic; distance along a linear asset, eg 150 metres along a canal.

### **4. Water source**

Record the details of the source of water used in the irrigation system. Include details of any structures and extraction systems, including dimensions, capacity, form of construction and materials used.

### **5. Channel Lining**

Record the size, profile, key dimensions and type of channel lining used in the construction of the canal. Key dimensions are the width, depth and hydraulic capacity. Individual canals should be defined so they have only one type of channel lining and dimensions. Subdivide a canal into sub sections based on the key dimensions and channel lining type.

## **1.1.2 Establish and Maintain Asset Files**

1. A facility should be provided for the storage of files and documents relating to individual assets. The facility should be secure, well ventilated, rodent proof and dry.
2. A file numbering system should be established. If an asset numbering system has been established these numbers can be used for file numbers. Files should be clearly marked and be stored in sequence.
3. A catalogue of files should be maintained that record the file number and description and the location of the file in the storage area.
4. The file should contain all documents and correspondence relating to the asset. Examples of documents that may be stored are correspondence, purchase details, operational manuals, warranty documents.
5. Large and bound documents may be stored separately for ease of access but details of documents stored elsewhere with details of how they may be found should be provided in the main correspondence file.
6. Establish a file for each asset. Establish sub-files as considered necessary to ensure efficient access to important or frequently accessed information.

7. Operational and maintenance information relating to the all assets should be stored in special files rather than copied into all asset files.
8. If a file becomes full and a new file opened the old file should be moved to a secure archive area so the number files in the working area are kept to a minimum.

### **1.1.3 Establish and Maintain Administration Files**

1. Documents and records relating to the administration of the asset management systems shall be maintained.
2. The records shall provide a transparent record of the administration and management of the asset management system.
3. The following records must be maintained for a period of 5 years: financial records, minutes of meetings, contracts and legal agreements.
4. Financial records shall include a cash book, details of all expenditures including authorization, receipts for all revenue in the form of cash or in kind.
5. It is desirable the following records are maintained: maintenance history and planning information.

### **1.1.4 Spare Parts**

1. Information on the type and number of spare parts shall be provided by suppliers at time of purchase, based on advise from a technical specialist or from the organisation's own experience.
2. A written technical specification for each spare part should be provided to ensure the correct item is always purchased.
3. Collect and store spare parts in a secure place in accordance with the manufacturer's recommendations.
4. Operational personnel shall be informed on the availability of spare parts.
5. An inventory of spare parts shall be maintained. The inventory shall include purchase details, where spare parts were used and the persons involved.
6. A procedure that will ensure replacements parts are provided from the most economical source should be developed. Procurement of spare parts should be initiated when the time taken to purchase and deliver the spare parts is approximately equal to the time it will take to consume the units in stock. These times can be determined from experience and may vary considerably.

## **1.2 Develop Operational Systems**

### **1.2.1 Commissioning**

#### **General**

1. Commissioning of new assets shall be the responsibility of construction and supply contractors. The role of contractors in commissioning shall be clearly defined in their contracts and supply agreements. Operational staff however should be involved in the commissioning of new assets to minimise set up problems. The following instructions are to assist operational personnel during the commissioning process.

#### **Final Inspection**

1. Operational staff should be involved in the final inspection of the asset before handover. In addition to checking for compliance with the workmanship and material specification operational staff should ensure all warranty and operational manuals are provided in accordance with the Contract.
2. Operational staff should obtain contact information from the Contractor.
3. Operational staff should ensure any defects are remedied as promptly as possible after the final inspection.

#### **Operational Plan**

1. Operational staff should ensure a suitable Operational Plan is prepared using the full resources provided in the construction or supply contract, their own resources and relevant technical specialists.
2. The Plan should be properly recorded and stored for future reference.
3. The Plan should detail tasks, resources required, roles and responsibilities and performance benchmarks.

#### **Operational Training**

1. Individuals shall be selected to perform each role in the Operational Plan. Individuals should be selected on their competence to either perform the tasks or successfully complete relevant training programs.
2. Operators shall undergo training, instruction and evaluation to ensure they attain levels of competence in the technical and administrative tasks they will need to perform. All Operators shall understand their level of authority, persons they should contact in case of emergency and environmental impact mitigation procedures.
3. Operators shall only be allowed to operate assets when they have attained the required level of competency.
4. Operator should undergo refresher instruction especially in emergency and environmental tasks.

## **Establish Procedures**

1. The necessary regulations, administrative and commercial steps required to implement the Operational Plan should be completed as part of the commissioning process and before the asset begins operation. These establishment tasks can be undertaken prior to the commissioning phase where the task can be identified.
2. The Owner should legally establish the required regulations needed to operate the asset eg officers assigned their roles and responsibilities, revenue raising powers enacted.
3. Administrative steps should be completed. Administrative steps could include providing office space and advising higher authorities.
4. Commercial steps could include establishing bank accounts and supply and maintenance contracts.

### **1.2.2 Buildings**

1. Operational systems for buildings depend to a large degree on the functional use of a building. The instructions provided below however are generic and relate to most types of buildings.
2. Use plumbing fittings and fixtures in an appropriate manner. Only dispose of non-viscous liquids into drains. Do not flush solid materials that can accumulate in pipes down floor wastes or flush toilets. Keep floor and basin orifices clean of hair and fibrous material.
3. Do not allow water to pond within building areas. Should water be spilled or leak from pipes it should be removed immediately. Report any pipe leaks or malfunctioning systems, eg roofs, gutters, pipes, to maintenance personnel.
4. Report any loose fittings to maintenance personnel for immediate repair before serious damage occurs.
5. Do not flush any non-human waste down flushing toilets. Keep toilet and latrine areas clean and dry.
6. Clean all surfaces regularly to protect the protection coating from deterioration.
7. Clean window frames so they operate smoothly.
8. Replace light globes as required. All public buildings should be well lit when being used at night to minimise the risk of injury.
9. Light fittings should be kept clean to maintain lighting levels.
10. Remove litter and dirt to protect against pest infestation.

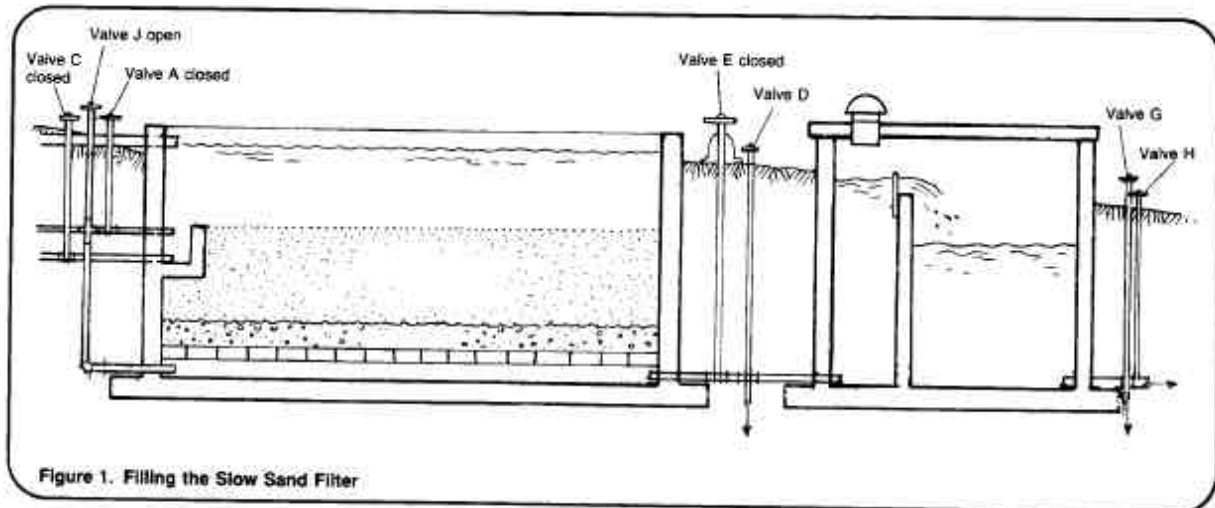
### **1.2.3 Wells**

1. The area around the wells should be kept clean and as dry as possible. No trees or shrubs should be allowed to grow adjacent to the well so that a shadow falls across the apron.
2. Grass in the vicinity of the well should be kept trimmed.
3. Maintenance staff should be notified if any cracks appear in the apron.
4. The rope and bucket used to extract water should be kept clean at all times. The bucket should not be removed from the well or used for any other purpose other than extracting water.
5. The apron area should not be used for washing utensils or clothes.

6. No chemicals or fertilizers should be used within 30 metres of the well.
7. Animals should not be allowed in the vicinity of the well.
8. Persons extracting water should clean their hands well before using the rope and bucket.

### 1.2.4 Water Filter

1. Refer to attached sketch for schematic details of a slow sand filter.



### Start Up

Preparation of the filter takes several weeks, as the sand bed must be adequately prepared to act as a biological filter.

1. Step 1: Close all outlet valves in the filter system and add potable water carefully to the sand filter through Valve A. Continue adding water until the sand is completely covered.
2. Step 2: Allow water to flow slowly through the sand filter for two weeks. This will develop on the sand filter the biological film that purifies the water. During this time all water from the filter should not be used for drinking or boiled before drinking.
3. Step 3: For best operation a constant flow of water should occur through the sand filter. To achieve this partly close Valve E so a constant rate of flow occurs.

### Operation

During operation the following instructions must be followed at all times.

1. The sand filter should always be covered by water. The top layer of the filter should never dry out.
2. If algae starts to develop on the sand filter a cover should be placed over the chamber.
3. The rate of water flowing into the Inlet Chamber should approximately equal the rate of flow into the Potable Water Chamber so the time spent in the Sedimentation Chamber is maximised.

The following instructions should be followed for optimum operational performance.

1. A constant flow of water should occur through the sand filter. This can be achieved by regulating the flow into the Potable Water Chamber with a partly closed tap.
2. As sediment accumulates in the sand filter Valve E should be opened slightly to maintain an adequate flow rate through the filter. Once the tap is fully opened and the rate of flow is less than the rate required to meet demand the sand filter should be cleaned.

## **1.2.5 Sanitation**

### **Latrines**

1. The area surrounding latrines should be kept clean.

### **Solid Waste Disposal**

1. Solid waste shall be classified into organic, non-organic and hazardous categories. Organic waste should be recycled by composting.
2. Non-organic waste can be further subdivided into recyclable and non-recyclable items. Recyclable items include metal, some types of plastics and paper. Recyclable items should be stored and sold to waste recycling companies.
3. Non-recyclable items should be disposed of in a sealed land fill that is not located near sources of drinking water.
4. All hazardous waste shall be stored and disposed of in an appropriate manner. The preferred method of disposing of hazardous waste is to send it to a competent hazardous waste disposal organisation. Hazardous waste includes batteries, some medical waste, pesticide containers and unused paint.

## **1.2.6 Electrical Reticulation**

1. Only technically competent personnel should undertake cleaning of electrical reticulation.
2. The demand for electricity should comply with the capacity of the system to supply it. Electrical equipment with large demand for electrical energy, like welders, should only be used in accordance with the operational guidelines provided by the designers of the system.

## **1.2.7 Roads**

1. The size and weight of vehicles using commune roads should be strictly enforced to protect the pavement material and culverts. Vehicles with an axle load greater than 7 tonnes should never be permitted to use commune roads when the pavement material is wet or soaked.
2. Use of feeder roads and minor access roads should be limited to essential traffic only after rain or during floods
3. Load limits provided by technical personnel for culverts should be strictly complied with.
4. Maintenance personnel should be advised as soon water does not drain from the carriageway due to the presence of ruts, potholes and depressions.

## **1.2.8 Bridges**

1. Load limits for bridges provided by technical personnel should be strictly enforced.

## **2 Module 2: Undertaking Condition Surveys**

### **2.1 Description**

1. In all cases the description of the asset should match the description provided on the Asset Record Form so the asset can be clearly identified. Include in the description any numbering system that has been developed.

### **2.2 Location**

1. In all cases the location description should match the location description used on the Asset Record Form. If a numbering system has been developed that uniquely identifies each asset the location information may be omitted as information on the location can then be obtained direct from the Asset Record Form.

### **2.3 Condition**

#### **2.3.1 Buildings**

##### **Roof, Fascias and Gutters**

###### **1. Gutters**

The structural condition of the gutter should be checked. Evidence of severe rusting of the supports or gutter profile, physical damage arising from impact or vandalism or loose fastenings shall be recorded. The condition of any applied finishes should be recorded. The cleanliness of the gutters should be recorded including the presence of blockages. Based on these field assessments identify the scope and urgency of remedial works. Localised structural damage should be repaired but general structural damage affecting at least 50% of the gutters should lead to replacement.

###### **2. Roof cladding**

The structural condition of the roof cladding, purlins, rafters and beams should be checked. Evidence of severe deterioration of the cladding, physical damage arising from impact or vandalism, structural damage to the roof support system or loose fastenings shall be recorded. The condition of any applied finishes should be recorded. Evidence of water ingress should be carefully assessed. The cleanliness of the roof should also be checked especially if drinking water is collected from the roof. Based on these field assessments identify the scope and urgency of remedial works. Localised structural damage should be repaired but general structural damage affecting at least 70% of the roof should lead to replacement.

###### **3. Fascia boards, ridge capping and flashings**

The structural condition of the item and any applied finishes should be checked. Based on these field assessments identify the scope and urgency of remedial works. Localised structural damage should be repaired but general structural damage affecting at least 50% of the gutters should lead to replacement.

## External Wall

### 1. Structure

The condition and structural integrity of the wall including the foundations should be assessed visually. A competent technical person should investigate any sign of potentially serious structural failure like cracks. This structural investigation may involve removing wall cladding or measuring differential settlements in the foundations. The technical person should recommend remedial works considering the extent of the risk, the relative value of repairs and the building and the availability of resources and expertise.

### 2. Surface

The condition of the wall cladding or plaster shall be assessed and remedial work identified. The ability of the surface to provide thermal insulation and stop water ingress shall be assessed. Any risk of water ingress should lead to urgent remedial works.

### 3. Protective coating

The condition of applied finishes and general cleanliness of the surface will be investigated and the need for painting assessed. Maintenance records, if available, should be consulted for the interval since the surface was last painted. Exterior surfaces should be repainted at least every 7 years.

## Yard

### 1. Surface drainage

Evidence of poor surface drainage leading to water ponding in the yard near the building should be investigated. Remedial action to eliminate water ponding should be identified and performed before the next wet season. The possibility of any large trees causing damage to the building either through their root system or falling branches should be investigated. The need to either remove or trim high risk trees should be assessed.

### 2. Pathways

The condition of the surface of pathways should be examined. All pathway surfaces should be smooth with no protrusions that may cause an invalid or elderly person to trip or stumble. All pathways should be clear of long or tangled vegetation. Recommend remedial action based on the investigation.

### 3. Fencing

The condition of the structure of any fences should be investigated. Evidence of posts not being vertical, loose fastenings or deterioration of the posts or fence cladding shall be recorded. Deterioration of the cladding to the extent that the fence does not restrict movement of humans or specific animals should lead to immediate remedial action.

#### 4. Lighting

Check the condition of any area lighting associated with the building. Check the lighting system is performing as designed and provides the level of lighting to suit its desired purpose. Identify and prioritise remedial work based on the investigation.

### Flooring

#### 1. Structural soundness

Check the structural rigidity of the floor system to perform in accordance with the current use of the space. The floors structural system should provide a firm and sound surface to suit the use of the space. Should the use of the space have changed recently special attention should be paid to the ability of the floor to withstand the loads associated with the new usage. Should there be evidence the structure of the floor is failing, the floor structure should be exposed and inspected by a competent person. The competent person shall recommend remedial action.

#### 2. Surface

The condition of the floor surface shall be assessed and remedial work identified. The ability of the surface to be easily cleaned and provide a safe walking surface shall be assessed. Any defects affecting human safety should be treated as urgent.

#### 3. Drainage/dampness

Should there be evidence that dampness is present in the floor, the sub-floor area should be exposed and inspected by a competent person to identify the source of the water and identify remedial action.

### Internal Wall

#### 1. Structure

The condition and structural integrity of the wall including the foundations should be assessed visually. A competent technical person should investigate any sign of potentially serious structural failure like cracks. This structural investigation may involve removing wall cladding or measuring differential settlements in the foundations. The technical person should recommend remedial works considering the extent of the risk, the relative value of repairs and the building and the availability of resources and expertise.

#### 2. Surface

The condition of the wall cladding or plaster shall be assessed and remedial work identified. The ability of the surface to provide privacy and sound insulation shall be assessed.

#### 3. Protective coating

The condition of applied finishes and general cleanliness of the surface will be investigated and the need for painting assessed. Maintenance records, if available, should be consulted for the interval since the surface was last painted. Interior surfaces should be repainted at least every nine years.

## **Ceiling**

### 1. Structure

The condition and structural integrity of the ceiling including the connection to the walls should be assessed visually. A competent technical person should investigate any sign of potentially serious structural failure like cracks or sagging. This structural investigation may involve gaining access to the roof space. The technical person should recommend remedial works considering the extent of the risk, the relative value of repairs and the building and the availability of resources and expertise.

### 2. Surface

The condition of the ceiling material shall be assessed and remedial work identified.

### 3. Protective coating

The condition of applied finishes and general cleanliness of the surface will be investigated and the need for painting assessed. Maintenance records, if available, should be consulted for the interval since the surface was last painted. Ceiling surfaces should be repainted at least every ten years.

## **Windows/Shutters**

### 1. Frames

The structural rigidity of the frame to support the window to the wall, stop water ingress, provide appropriate security and allow the window to be opened safely should be assessed. Should the frame not perform as intended an assessment should be made on either replacing or repairing the frame. Check the condition of the protective coatings and the need for applying a new coat.

### 2. Glazing

Check the glass and replace any cracked panes. Check and suggest remedial work associated with the glazing fastening system. The fastening system must be able to stop the ingress of water.

### 3. Security

Investigate the performance of any security systems associated with the window. Recommend remedial works to ensure the security system performs as intended.

## **Doors**

### 1. Structure

The condition and structural integrity of the door and door frame should be assessed visually. Recommend remedial work based on the visual inspection.

### 2. Surface

The condition of the door shall be assessed and remedial work identified.

### 3. Protective coating

The condition of applied finishes and general cleanliness of the surface will be investigated and the need for painting assessed. Maintenance records, if available, should be consulted for the interval since the surface was last painted.

### 4. Hinges and locks

The performance of the hinges and locks to operate as intended shall be assessed. The hinges should be securely fastened to both the door and the doorframe. The hinges should support the door and operate so the door is easily opened. All locks and latches should perform as intended.

## Lights

### 1. Light fittings

Visually inspect the condition of light fittings. Light fittings should not be broken or cracked. Light fittings should be clean so they reflect the maximum amount of light. Light fittings should be securely fitted to the surface they are attached to. Check fluorescent tube starters are not defective. Based on the investigation recommend remedial work.

### 2. Switches

Visually inspect all switches for any signs of cracks, loose fastenings or broken components. Check the switch effectively operates the relevant light fitting. Based on the investigation recommend remedial work.

### 3. Globes/tubes

Visually check globes and tubes are not defective.

## Power Outlets

1. Visually inspect all outlets for any signs of cracks, loose fastenings or broken components. Check the switch operates as designed. Based on the investigation recommend remedial work.

## Built in Items

### 1. Cupboards

Visually inspect cupboards for signs of deteriorated materials or faulty mechanisms. Check the cupboard is securely fastened and no deterioration of the structure or finishes have occurred. Check all latches and locks operate as intended. Check the condition of finishes. The finishes should provide a smooth surface that may be easily cleaned. Based on the investigation recommend remedial work.

### 2. Taps/drains

Visually inspect all taps and drain orifices for signs of deteriorated materials or faulty mechanisms. Check taps do not leak, drains flow freely and drain orifices are rodent proof. Check taps and drain orifices are securely fixed. Based on the investigation recommend remedial work.

### 3. Basins/sinks

Visually inspect basins and sinks for signs of deteriorated materials or faulty mechanisms. Check they are securely fastened and no deterioration of the structure or finishes have occurred. Check all connections to pipes and drains are secure and watertight. Basins and sinks should have smooth surfaces that may be easily cleaned. Items with badly cracked or rusted surfaces should be replaced. Based on the investigation recommend remedial work.

## Septic Tanks

### 1. Manholes & openings

Visually inspect all manholes and openings. All manholes and openings should be completely covered with an airtight lid. Manholes and openings should be able to be opened readily using the correct tools. Cracked or defective lids and frames should be replaced. Based on the investigation recommend remedial work.

### 2. Inlet and outlet junctions

Visually inspect the junctions of the inlet and outlet pipes with the septic tank. The junctions should provide an unrestricted flow path. Based on the investigation recommend remedial work.

### 3. Chamber

Check the water level in the chamber for evidence of leakage. Check the level of sludge is no more than a third of the chamber depth. If the sludge is greater than a third of the total water depth the sludge should be removed. Based on the investigation recommend remedial work.

## 2.3.2 Water Filter

### Foundation

#### 1. Structure and ground condition

The condition and structural integrity of the foundation should be assessed visually. Evidence of foundation failure will be cracking in the walls and differential settlement of the foundation. If the structure is large enough or important enough to warrant it a competent technical person should investigate any sign of potentially serious structural failure like cracks. The technical person should recommend remedial works considering the extent of the risk and the importance of the structure.

### Walls

#### 1. Structure

Visually check the conditions of the wall. Recommend remedial works considering the extent of the risk and the importance of the structure.

#### 2. Surface

The condition of the wall cladding or plaster shall be assessed and remedial work identified.

#### 3. Water tightness

Inspect for signs of water leaks and recommend remedial works.

#### 4. Protective coating

The condition of applied finishes and general cleanliness of the surface will be investigated and the need for painting assessed. Maintenance records, if available, should be consulted for the interval since the surface was last painted.

### Valves

#### 1. Corrosion & water tightness

Visually check the conditions of valves for evidence of leaks and general condition. Based on the inspection recommend remedial works.

### Sand

#### 1. Contamination

Check the sand layer for evidence of organic contamination that could impact on water quality. Based on the inspection recommend remedial works.

#### 2. Depth of filter/Presence of algae

Check the minimum sand depth as recommended by the designer is still available. Check for the presence of algae that may develop if the filter bed chamber is exposed to sunlight. Based on the inspection recommend remedial works.

### 2.3.3 Electricity Reticulation

#### Power Poles

##### 1. Structure

Visually check the conditions of power reticulation poles for signs of deterioration. Recommend remedial works considering the extent of the risk and the importance of the structure.

##### 2. Foundation

Visually check the condition of the foundation of the pole. Check the pole is aligned vertically. Based on the inspection recommend remedial works.

##### 3. Beams/Connections

Visually check the condition of the cross-beams and cable support connections on the poles. Based on the inspection recommend remedial works

#### Pole Insulators

##### 1. Soundness

Visually check the conditions of insulators for signs of deterioration or cracking. Check physical damage, like cracking or chipping, has not occurred to the insulators. Check insulators are securely fastened to the cross-beams and cables are securely fastened to the insulators. A competent person should recommend remedial works based on the results of the investigation.

## 2. Cleanliness

Visually check the cleanliness of the insulators. A competent person should recommend remedial works based on the results of the investigation.

## Circuit Breakers

1. Circuit breakers need to be inspected by a competent technical person with appropriate experience. Testing the condition of a circuit breaker involves using specialist testing equipment and outside the scope of this training module.
2. Ensure the condition survey is undertaken by a suitably qualified person, the results of the investigation are stored and recommendations acted upon.

## Transformers

1. Transformers need to be inspected by a competent technical person with appropriate experience. Testing the condition of a transformer involves using specialist testing equipment and outside the scope of this training module.
2. Ensure the condition survey is undertaken by a suitably qualified person, the results of his investigation are stored and the recommendations are acted upon.

## Cables

1. Insulation/Terminations

Visually check the conditions of cable insulation and terminations for signs of deterioration or cracking. A competent person should recommend remedial works based on the results of the investigation.

## Vegetation

1. Dangerous trees

The possibility of any large trees causing damage to the electrical reticulation either through their root system or falling branches damaging cables and equipment should be investigated. The need to either remove or trim high risk trees should be assessed.

## 2.3.4 Roads

### Carriageway

1. Surface condition/Pothole & Rutting

Visually check the conditions of the surface of the carriageway and record the presence of any ruts, corrugations or potholes causing water to pond on the carriageway. Record the presence of a crown in the center of the road and the general shape of the carriageway surface. Recommend the works required to provide a central crown and free draining carriageway surface.

## 2. Thickness of pavement

Measure the depth of pavement in centimetres by excavating through the pavement till in-situ material is encountered. Calculate the depth of pavement lost by comparing with the recommended design thickness of the pavement. If there is no recommended pavement design thickness available assume a thickness of 15 centimetres is required. Based on the inspection and calculations recommend remedial works.

## 3. Width of pavement

Measure the width of pavement in metres by inspection. Calculate the width of pavement lost by comparing with the recommended design width of the pavement. If there is no recommended pavement design width available assume each lane is 2.25 metres wide for minor roads and 3 metres for major village roads. Based on the inspection and calculations recommend remedial works.

## Shoulder

### 1. Surface condition/Scouring

Visually check the conditions of the surface of the shoulder and record the presence of any ruts, corrugations or potholes affecting drainage. Record the general shape and width of the shoulder. Recommend the works required to maintain surface drainage.

### 2. Vegetation

Visually check the condition of any vegetation in the vicinity of the road and its impact on drainage and the operation of the road. All vegetation on the shoulder and its table drains should be kept neatly trimmed and all shrubs and trees removed from the shoulder. Recommend the works required to trim vegetation and remove trees affecting the operation of the road.

## Embankments

### 1. Stability/Scouring

Visually check the conditions of the embankments with emphasis on slope failures of cut and fill embankments and scouring of fill embankments. Record the presence of landslips and scouring on embankment. Recommend the works required to ensure the stability of embankments and remove material deposited in table drains, shoulder and carriageway from failures of cut embankments.

### 2. Vegetation

Visually check the condition of any vegetation on embankments in the vicinity of the road and its impact on drainage and the operation of the road. Recommend the works required to trim vegetation and remove trees affecting the operation of the road.

## Culvert Pipe

### 1. Structure

Visually check the conditions of culvert pipes for signs of deterioration or structural failure. Culvert pipes should be replaced if their structure has collapsed. Based on the investigation recommend remedial works.

## 2. Cleanliness

Check the presence of silt and debris that is restricting the flow of water through the culvert pipe. All silt and debris should be removed from full length of the culvert pipe. Based on the investigation recommend remedial works.

## Outlet Channel

### 1. Cleanliness

Check the presence of silt and debris that is restricting the flow of water through the outlet channel of culverts. All silt and debris should be removed from the outlet channel so water flows freely away from the culvert. Based on the investigation recommend remedial works.

### 2. Scouring

Check the presence of scouring in the outlet channel that may affect the stability of the embankments. Where scouring has the potential to undermine the road embankment the scouring should be backfilled and the surface of the channel reinforced with either concrete or large stones. Based on the investigation recommend remedial works.

### 3. Vegetation

Visually check the condition of any vegetation in outlet channels and its impact on drainage and the operation of the road. Recommend the works required to trim vegetation and remove trees affecting the operation of the road.

## Culvert Headwall

### 1. Structure

Visually check the conditions of culvert headwalls for signs of deterioration or structural failure. Culvert headwalls should be replaced or repaired if the headwall can no longer support the embankment above the culvert. Based on the investigation recommend remedial works.

### 2. Cleanliness

Check the presence of silt and debris that is restricting the flow of water through the headwall. All silt and debris should be removed from the floor of the headwall. Based on the investigation recommend remedial works.

## Table Drains

### 1. Cleanliness

Check the presence of silt and debris that is restricting the flow of water along table drains. All silt and debris should be removed from table drains. Based on the investigation recommend remedial works.

### 2. Shape

Check the presence of scouring in table drains that may affect the stability of the embankments. Where scouring has the potential to undermine the road embankment the scouring should be backfilled and the surface of the drain reinforced with either concrete or large stones. Based on the investigation recommend remedial works.

## **Signage**

### 1. Structure

Visually check the condition of signs structures for evidence of deterioration or structural failure. Based on the investigation recommend remedial works.

### 2. Missing signs/Legibility

Check for missing or illegible signs. Based on the investigation recommend remedial works.

## **Safety Barriers**

### 1. Structure

Visually check the condition of safety barrier structures for evidence of deterioration or structural failure. Based on the investigation recommend remedial works.

## **2.3.5 Bridges**

### **Waterway Channel**

#### 1. Vegetation

Visually check the condition of any vegetation in the waterway channel under the bridge and its impact on drainage. Recommend the works required to trim vegetation and remove trees affecting the flow of water under the bridge.

#### 2. Scouring

Check the presence of scouring in the waterway channel that may affect the stability of the bridge abutments. Where scouring has the potential to undermine the bridge abutments scouring should be backfilled and the surface of the channel reinforced with either concrete or large stones. Based on the investigation recommend remedial works.

## **Riprap**

### 1. Condition

Check the condition of riprap and other types of scour protection provided to protect the abutments of the bridge. Check the riprap stones have not been moved and still provide an effective protection against scouring of the area around the bridge abutments. Based on the investigation recommend remedial works.

## **Abutments**

### 1. Structure/Foundation

Visually check the condition of the abutment structure for evidence of deterioration or structural failure. Based on the investigation recommend remedial works.

## **Deck**

### 1. Structure

Visually check the condition of the deck structure for evidence of deterioration or structural failure. Based on the investigation recommend remedial works.

## **Wing Walls**

### **1. Structure/Foundation**

Visually check the condition of the wing wall structure for evidence of deterioration or structural failure. Based on the investigation recommend remedial works.

## **Signage**

### **1. Condition**

Visually check the condition of the structure of signs for evidence of deterioration or structural failure. Based on the investigation recommend remedial works.

### **2. Legibility**

Check for missing or illegible signs. Based on the investigation recommend remedial works.

## **Safety Barriers**

### **1. Structure**

Visually check the condition of safety barrier structures for evidence of deterioration or structural failure. Based on the investigation recommend remedial works.

## **2.3.6 Irrigation**

### **Headwall**

#### **1. Structure**

Visually check the conditions of irrigation headwalls for signs of deterioration or structural failure. Headwalls should provide a firm foundation for inlet structures and protect the embankment. Based on the investigation recommend remedial works.

#### **2. Cleanliness**

Check the presence of silt and debris that is restricting the flow of water through the headwall. All silt and debris should be removed from the floor of the headwall. Based on the investigation recommend remedial works.

## **Open Unlined Drain**

### **1. Wall stability**

Visually check the side-walls of the drain for minor landslips. All minor landslips should be repaired as they will increase the instability of the side-walls. Repair landslips by removing the material from the drain, reforming the shape of the drain using a well graded gravel and protecting the surface with concrete or stones. Based on the investigation recommend remedial works.

### **2. Scouring**

Check the presence of scouring in the drain that may affect the stability of the embankments. Where scouring has the potential to undermine the road embankment the scouring should be backfilled and the surface of the channel reinforced with either concrete or large stones. Based on the investigation recommend remedial works.

### 3. Vegetation

Visually check the condition of any vegetation in the drain and its impact on and the operation of the drain. Recommend the works required to trim vegetation.

## **Open Lined Drain**

### 1. Condition of lining

Visually check the condition of the channel lining for evidence of deterioration or structural failure. Based on the investigation recommend remedial works.

### 2. Cleanliness

Check the presence of silt and debris that is restricting the flow of water in the drain. All silt and debris should be removed from the drain. Based on the investigation recommend remedial works.

### **Limitations**

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The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

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