CULVERT MAINTENANCE

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General

A culvert is a cutting under or beside a road which allows water to drain, rather than becoming stagnant and making road conditions hazardous. Technically, only an enclosed tunnel under a road can be classified as a culvert, and a cutting next to a road is called a ditch, but some English speakers use the term “culvert” to refer to either. Culverts are a vital part of the system used to drain roads and drives, keeping them safe and extending their lifetimes.

Ideally, a culvert is installed when a road is built, either by the local highway authority or a property owner, if the culvert is on private land. Generally, if a section of a road lies in a depressed area of ground or a region subject to flooding, a culvert should be installed to facilitate drainage. The culvert is laid into the road bed while it is being built, and is kept clear by maintenance crews during routine checks of the roadway throughout the year.

Culverts serve two major functions:

1. A culvert allows water to drain under the road, rather than stagnant or pooling on top of it, making the surface safer for drivers. Stagnant water on a road can cause cars to experience hydroplane, conceal hazards on the roadway, and will ultimately deteriorate the roadway, causing it to break down quickly.

2. To keep water from collecting along the verges of the roadway and cause scouring or water ponding that may cause hazard to users. This will extend the life of the road and prevents the edges of the roadway from slowly crumbling away, posing a safety hazard to drivers.

A culvert can be built from a wide variety of materials, depending on the size and where it is installed. Concrete, metal, and polyethylene are all common choices to line the cutting used to make a culvert, preventing the sides from caving in. Extremely big enough for a heavy volume of winter water, ones may not be much household plumbing: enough to divert the drainage area. If a effective enough, it may with a small raised elevated structure or elevate the roadway frequently flooded area.
Culvert Inspection

The key of effective maintenance is regular schedule of inspections to determine the maintenance need and to ensure that required maintenance is done. Inspections are done in a regular interval during the service life of the culvert to ensure that satisfactory conditions exist and to evaluate needs for cleanup and repair in advance of the wet season.

Inspections are also made to monitor existing defects that have not been repaired as well as to monitor any defects that had been repaired. Inspections can be divided into the following categories:

- **General Inspections**
  Is a routine and frequent inspection conducted to culverts located in critical areas, i.e. flooding areas and areas adjacent to third party development. The inspections are undertaken at regular/frequent interval, as and when required to detect for damage structure and blockage of waterway at early stage within a visible range.

- **Periodic Inspection**
  Is a primarily designed to carry out more detail inspection periodically for culverts on foot by accessing the subject as close as possible. These inspections should determine the current serviceability and structural status of the culverts. The frequencies of inspections are undertaken at interval of once a year.

- **Special Inspection**
  Is the supplementary inspection in addition to the general inspection and periodic inspection, for example, in occasional cases such as storm and heavy rain.

**Elements for Inspection**

- Check the accumulation of debris, siltation or other flow impediments at inlets and outlets
- Inspect the culvert barrel, if possible, for tree or other vegetation roots, mineral deposits, trash or silt accumulations and other foreign objects obstructing flow paths.
- Examine inlet and outlet areas for evidence of soil erosion, which generally leads to scour, undermining and caving of adjacent soil supporting the culvert. Soil erosion quickly leads to reduced structural and hydraulic performance.
- Inspect all visible structures such as sumps, headwalls, wingwalls, culverts and aprons for sign of wear or breakage.
- Check upstream for evidence of backup or prolonged surface water presence that indicated reduced inflow. Check downstream for evidence of foreign material that indicate reduce filtration of soil or structural degradation of drainage system itself.
Inspection of waterway

- **Hydraulic Capacity**
  - to determine any high water marks indicating flood or presence of obstruction causing ponding

- **Siltation and Debris in or near Culvert**
  - to check the severity of siltation and debris within the culvert barrel as well as at inlet and outlet of culvert and it depth shall not be greater than 0.2D where D is diameter of pipe culvert or height of box culvert.

- **Vegetation**
  - to check the vegetation growth within the waterway both at inlet or outlet of the culvert and coverage shall not be greater than 20% of waterway section.

- **Scouring or Undermining**
  - to check for scouring and undermining at the ends of culvert or at the edge of apron.

Inspection of Culvert Structures

a. **Reinforced Concrete Pipe / Box Culvert / VBC**
   - to check the culvert barrel for settlement, abrasion of lining, cracking / spalling of concrete, and corrosion of reinforcement.

b. **Corrugated Metal Pipe Culvert (CMP) / High Density Poly Ethylene (HDPE)**
   - to check for change of shape of culvert barrel, abrasion of lining, damaged or deterioration to paint or galvanizing, corrosion of metal and loose or corroded bolts.

c. **Inlet and outlet structure for Drainage / RHS and LHS Entrance for VBC**
   - to check movement (settlement or sideways movement)
   - for concrete structures to check for cracking / spalling of concrete and corrosion of reinforcement.
   - for masonry structures to check for cracking, poor pointing or deterioration of bricks or stone.
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<th>Strategy</th>
<th>Objective</th>
<th>Work Option</th>
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| Routine Maintenance     | Keep a culvert in a uniform and safe condition by repairing specific defects as they occur | -debris and sediment removal  
                        |                                                                           | -thawing frozen culverts                                                 |
| Rehabilitation          | Takes advantage of the remaining usable culvert structure to recondition a culvert | -joint sealing  
                        |                                                                           | -mortar repair  
                        |                                                                           | -invert paving  
                        |                                                                           | -scour preventing  
                        |                                                                           | -lengthening of culvert                                                  |
| Upgrade to Equal Replacement | Upgrade to provide service that is equal to that provided by a new structure | -Addition, repair, or replacement or appurtenant structures  
                        |                                                                           | -Lining of the barrel  
                        |                                                                           | -Provision of safety grates or safety barriers  
                        |                                                                           | -Lengthening of the culvert                                              |
| Replacement              | Provide a completely new culvert with a new service life                   | Can be accompanied by:  
                        |                                                                           | -Realignment  
                        |                                                                           | -Hydraulic structure and safety improvements  
                        |                                                                           | -Change in culvert shape or material                                      |

This table illustrates work options for different strategies, such as routine maintenance, preventative maintenance, rehabilitation, and replacement. For each strategy the objectives are different and at least two work options are listed.
Conclusions

It is vital to ensure the functionality of the culverts is at its optimum condition. Schedule routine maintenance and periodic up-keeping of the condition of the culverts and their surrounding must be programmed and monitored at all times. Any discrepancy in the programme will affect the performance of the culvert and as a result more allocations have to be spent in ensuring that the culverts are in good working condition.

The authority who is maintaining the road or property must have a proper schedule and personnel to conduct the inspection activity. A culvert inventory and thus database must be available as well as the drawings for continuity of the maintenance. A culture of maintenance must be instilled to ensure the culvert life is prolonged and secured.
References:


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