
Culvert Inspection and Rehabilitation

Most municipalities in NH own hundreds, if not thousands, of culverts. As they age, culvert deterioration can become a serious financial problem for agencies. This article will discuss culvert inspection and repair as published in a recent Transportation Research Board study.

Inventories and Inspection

Creating and maintaining a culvert inventory allows agencies to know and track the condition of their culverts. An inventory saves time and money by enabling municipalities to schedule needed repairs and eliminating or reducing the number of failures.

A regular inspection schedule assists road managers to plan individual culvert inspections. Municipal inspection guidelines may vary depending on the size, type, and location of the culvert. Inspect major pipes at least every 3 years and more often where conditions are harsh, such as where there is brackish water, seawater, acidic runoff, or industrial discharge. Inspections should include channel rating (to indicate the amount of the scour), embankment erosion, siltation, etc. expected.

To create a successful inventory and management system, road managers may use these tips:

- Establish a standard set of guidelines to perform inspections,
- Train the inspectors to identify defects and severity, and to accurately complete the inspection reports,
- Collect data consistently, and
- Determine if a pipe needs repair, rehabilitation, or replacement during the inspection and report the findings.

One benefit of a culvert inspection and management system is to justify funds and prioritize work. An inventory reduces the likelihood that a pipe will deteriorate to a state where the roadway surface will dip or fail completely, resulting in the need to do costly unscheduled repair or rehabilitation immediately.



Repair and Rehabilitation

Repair culverts to keep them in uniformly good and safe condition. Repair activities include patching, crack sealing, invert paving, lining, or joint work. Correcting light deterioration detected by the inventory avoids more future serious problem.

Create specifications so contractors understand local requirements and expectations of culvert repair or rehabilitation work. Many agencies use construction specifications to address issues and requirements when a pipe is installed. However, when a pipe is lined, the requirements, issues, and processes are different.

Repair Strategies

According to the study, culvert lining is the most reported method of permanent structural stabilization. When managers have insufficient funds to perform major or deep excavations, the roadway is paved, or the traffic volume is high, they have used invert replacement, insertion of a pipe inside the deteriorating pipe, or installation a lining to avoid cut and cover.

The liner wall needs to be as thin as possible to maximize culvert flow capacity. Liners are forced through the culvert (pipe jacking) or pulled through. When repairing a segment or small portion of a culvert, install a section or two of liner by positioning the liner at the deteriorated area and jacking against the existing culvert.

Consider culvert replacement instead of rehabilitation when a pipe deteriorates to a point where:

- its structural integrity or soil support is lost;
- there are insurmountable problems, such as soil migrating through pipe joints;
- the roadway over the pipe is lost (excessive deflection);
- the elevation of the invert needs to be changed;
- or
- there is a lack of hydraulic capacity.

A culvert maintenance program saves the town money because repairs are managed and unscheduled costly emergency work is reduced.

Note: The NHDOT specification for culvert lining is 603.869 XX. Contact the UNH T² Center for a copy.

Source:

Assessment and Rehabilitation of Existing Culverts, A Synthesis of Highway Practice, Transportation Research Board, NCHRP Synthesis 303, 2002

High Visibility Clothing

High visibility clothing (ANSI 107 standard performance) refers to reflective and florescent vests, shirts, pants, hats, etc. that workers should wear to make them more visible when working near traffic and heavy equipment. The types of clothing one should wear depend upon the hazards they are likely to face.

- **Class 1 garment:** for workers that are separated from vehicular traffic of less than 25 mph. where background setting and worker tasks are not complex.
- **Class 2 garment:** necessary for greater visibility during inclement weather; where work background is more complex and close to moving traffic or vehicles; worker's attention will likely be diverted from traffic traveling 25-50 mph.
- **Class 3 garment:** where traffic speed is greater than 50 mph; workers must be conspicuous.

Source: Transportation Builder, Summer 2005, ARTBA, pg. 62

Options for Culvert Maintenance

Strategy	Objective	Work Option
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 prevention -Ditch cleaning & repair
Upgrade to Equal Replacement	Upgrade to provide service that is equal to that provided by a new structure	-Addition, repair, or replacement of appurtenant structures -Lining of the barrel -Provision of safety grates or safety barriers -Lengthening of culvert
Replacement	Provide a completely new culvert with a new service life	Can be accompanied by: -Realignment -Hydraulic structural 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.