Rehabilitation & extended concrete box.

■ Rehabilitation & extended concrete box.

rial is flushed ahead of the nozzle by spray action. This extremely mobile machine can be used for cleaning areas with light grease problems, sand and gravel infiltration, and for general cleaning.

REHABILITATION

Rehabilitation of the infrastructure is a major undertaking now being addressed by federal, state, and local governments. While the magnitude of rehabilitation may at times appear enormous, rehabilitation often is very cost-effective when compared to the alternative of new construction.

This section deals primarily with the use of CSP, corrugated structural plate, or steel tunnel liner plates to cost-effectively restore the structural capacity of deteriorated or failing culvert and bridge structures. These deteriorated structures include precast or cast-in-place concrete structures, concrete, steel or plastic pipe and all types of existing bridge structures. The corrugated steel material is typically inserted or assembled inside the failing structure and the annular space between the liner and deteriorated structure is filled with grout. This rehabilitation technique is commonly referred to as slip lining. After the grout has set, the repaired structure usually becomes much stronger than the original one and remains virtually free of distress.

Deteriorated CSP structures can often be rehabilitated by merely providing a new wear surface in the invert. If necessary they can also be repaired by slip lining or by a number of other methods to provide a new, complete service life at a fraction of the cost or inconvenience of replacement. A practice for placing a concrete invert or entire lining is provided in ASTM specification A 979/A 979M. Some of these repair and rehabilitation methods are also described in this section.

All of the methods described herein require a complete inspection and evaluation of the existing pipe to determine the best choice of corrugated steel material and coatings.

Rehabilitation by Slip Lining

Materials and Details for Slip Lining

Use of CSP or structural plate products has a number of advantages for sliplining applications. Standard corrugated steel pipe, manufactured in accordance with AASHTO M 36 or ASTM A 760/A 760M, may be provided in any lengths which would facilitate insertion at the site. The CSP liner pipe can be manufactured to any standard size or virtually any custom size, round or arched in shape, to fit the existing pipe cross-section. Accurate surveying of the existing structure is important to determine the maximum size of liner pipe that can be installed. A hydraulic advantage may be gained by using helical corrugated steel pipe if the existing pipe is annular corrugated or hydraulically rough due

to excessive deformations. If the owner desires to maintain maximum hydraulic capacity of the line, then the use of a smooth lined corrugated steel pipe is recommended. Choices of this type of pipe include ribbed pipe, double wall CSP, 100% cement mortar lined, and 100% asphalt lined. A number of coatings are also available to provide the required remaining design life for the structure (see Durability Chapter 9).

Figure 12.3 Typical slip lining installation with a pipe arch shape to suit existing cross-section.

CSP is lightweight, making it easy to handle and install. Skid devices may consist of steel or pressure treated wood guide rails placed on the invert of the existing pipe, or skid bars attached to the liner pipe to facilitate moving it in to the desired location. These devices also maintain a minimum space between the bottom of the liner and the existing structure to facilitate proper grouting. Adjusting bolts are used to secure the slipline pipe in position and prevent floating of the pipe during grouting. These usually consist of 3/4 inch diameter rods, threaded through nuts or steel angles welded to the outside of the liner plate. Typical spacing is approximately 5 to 10 foot centers and at about 40 degrees on each side of the top centerline. For relining a concrete box shape, three sets of these rods would be used, located at the top and spring line on each side of the liner pipe. Grout fittings are welded to the liner pipe wall at positions and spacing as determined by the Engineer. See Figures 12.8 and 12.9 for typical details of slip line installations.

Figure 12.4 Pipe sections can be fabricated in lengths as required to suit slip lining installation.

Figure 12.5 Liner pipe is easily installed by pushing or pulling through host pipe using conventional equipment.

Figure 12.6 Liner pipe being installed in an existing concrete box.

Figure 12.7 Deep corrugated box culvert lining a falling bridge. Note the dozer pulling the corrugated box culvert into position.

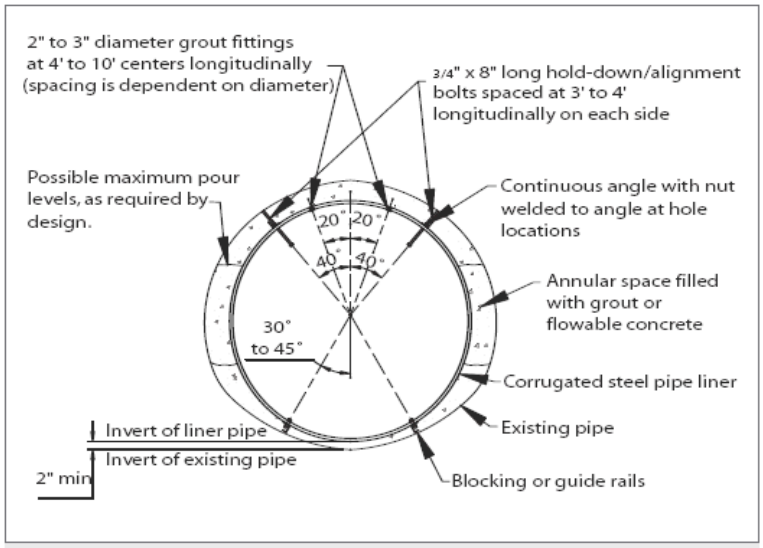

Figure 12.8 A typical section of a corrugated steel pipe slip line installation in a round pipe.

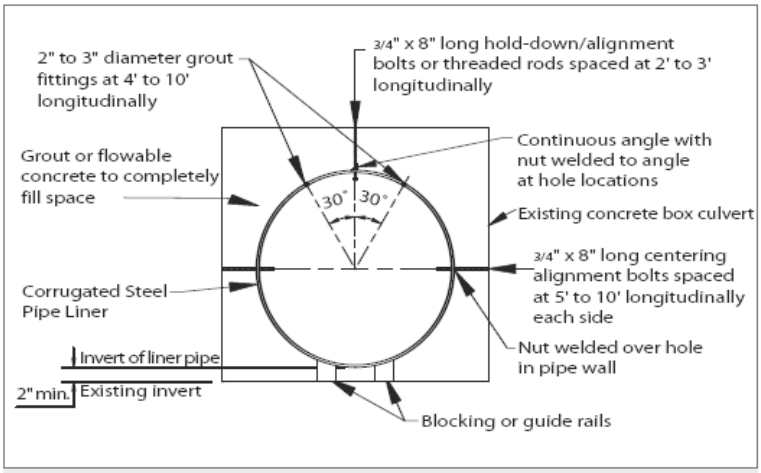

Figure 12.9 A typical section of a corrugated steel pipe slip line installation in a concrete box culvert.