



For Every Corner of Your World

Tennessee Avenue and Beach Thorofare _ Ocean City, NJ 08226
Phone: (609) 399-2417 _ Fax: (609) 399-5233 _ Email: pault@corrpro.com

August 23, 2000

Mr. Brian Roberts
National Corrugated Steel Pipe Association
155 Twenty-third Street, NW
Washington, DC 20037-1174

Re: Inspection of Corrugated Steel Pipe in Berrien County, Michigan

Dear Mr. Roberts:

Following is our report on inspections of corrugated steel pipe installed at several locations in Berrien County, Michigan. Should you have any questions, do not hesitate to contact me.

Introduction

Innovative materials are continually being developed for corrugated steel pipe to improve their durability. One of the best ways to determine the durability of these materials is long-term exposure in a "real-world" installation. Periodic evaluation of the materials over many years increases our comfort at projecting service life. Several polymer-precoated corrugated steel (Dow Trenchcoat) pipes were installed during the construction of the new US-31, north of US-12 in Berrien County, Michigan.¹ These pipes were installed over 20 years ago. This report details their present condition at a July 24, 2000 inspection.

Inspection Findings

On June 16, 2000, representatives from Corpro, Dow, and St. Regis Culvert inspected eight polymer coated corrugated steel pipes at four locations associated with the construction of the new US-31. The inspection was limited to a visual and physical examination of the pipes. All observations of our inspection on July 24, 2000 were consistent with other inspections of Dow Trenchcoat performed by the author. Specifically, the Trenchcoat coated pipe was in excellent condition, with only minor delamination observed at cut edges and coating defects in the invert. No significant steel corrosion was observed. The following details our observations.

Location A was just north of the St Joseph River on US-31. Three polymer-coated pipes were inspected at this location:

1. A 30-inch diameter pipe under the Northbound Lane. At the time of inspection, the pipe was dry. Film thickness measurements confirmed that it was coated with a 10-mil film on

¹ Michigan Project Number ACF 31-1 (308), Control Section FR 11057, Job Number 07815A, State line – Niles Road, Berrien County, Bertrand & Niles Twps.

either side. The polymer film was observed to be intact, smooth, and pliable. The date on one stencil was 12/29/77.

2. A 42-inch diameter pipe feeding water from the median down to the river. At the time of inspection, the pipe was dry. It was installed on a steep slope – estimated to be greater than 10 degrees. Film thickness measurements confirmed that it was coated with a 10-mil film on either side. The polymer film was observed to be intact, rough, and pliable. The roughness of the polymer film is likely due to abrasive material flowing down the pipe during peak storm water flow. Several gouges were observed in the coating. In the invert, coating could be peeled back from those gouges for a length of approximately 1-inch. The coating was intact and could not be lifted at the edges of those gouges that were in the sides of the pipe.
3. A 30-inch diameter pipe under the Southbound Lane. At the time of inspection, the pipe was dry. Film thickness measurements confirmed that it was coated with a 10-mil film on either side. The polymer film was generally observed to be intact, smooth, and pliable. Several feet inside of the pipe (from the median end) there was a weld joining two sections of polymer coated pipe at a slight angle. At the weld, there was steel corrosion where the welding process left uncoated metal (i.e., both the polymer and the zinc coatings had been burned off). The corrosion did not result in detectable section loss or penetration. The cut end of the pipe in the median was not re-rolled. In the invert, the polymer was undercut approximately 2-inches from the edge. Where the polymer could be lifted, the galvanizing was intact and no steel corrosion was evident.

Location B was just south of the St Joseph River on US-31. Three polymer-coated pipes were inspected at this location:

1. A 24-inch diameter pipe in the median adjacent to the Southbound Lane, draining water toward the River. At the time of inspection, the pipe was dry. Film thickness measurements confirmed that it was coated with a 10-mil film on either side. The polymer film was observed to be intact, smooth, and pliable. There was a very small area where the film had cutback (approximately $\frac{1}{2}$ -inch) from the cut edge at the inlet of the pipe.
2. An 18-inch diameter pipe in the median adjacent to the Northbound Lane, draining water toward the River. At the time of inspection, the pipe was dry. The pipe has a steep slope – estimated to be greater than 10 degrees. Film thickness measurements confirmed that it was coated with a 10-mil film on either side. The polymer film was observed to be intact, smooth, and pliable. There was a tough, brown and white deposit in the invert. Underneath the deposit, the polymer film was observed to be intact. Probing with a razor knife suggested that there may be slight loss of film adhesion in the invert, but there was no evidence of delamination.
3. A 24-inch diameter pipe in the median adjacent to the Northbound Lane, draining water toward the River. At the time of inspection, the pipe had a trickle flow of water. The pipe was installed on a steep slope – estimated to be greater than 10 degrees. Film thickness measurements confirmed that it was coated with a 10-mil film on either side. The polymer film was observed to be intact, smooth, and pliable. There was moss growth on the lower half of the pipe. Removal of this moss revealed intact polymer film.

Location C was at the southbound exit ramp from US-31 to US-12. One polymer-coated pipe was inspected at this location:

1. A 24-inch diameter pipe under the exit ramp. At the time of inspection, the pipe was dry. Film thickness measurements confirmed that it was coated with a 10-mil film on either side. The polymer film was observed to be intact, smooth, and pliable. The stencil was

partially legible, and the year of manufacture was evident to be "77." There was growth and mud in the invert of the pipe. Underneath this growth, the polymer film was intact. The north end of the pipe was not re-rolled. In the invert, the polymer was undercut approximately 2-inches from the edge. Where the polymer could be lifted, the galvanizing was intact and pinpoint steel corrosion was evident.

Location D was along the Amtrak right-of-way to the east of US-31. One polymer-coated pipe was inspected at this location:

1. A 36-inch diameter pipe under a driveway that heads north from the right-of-way into an agricultural field. At the time of inspection, the pipe was dry. Film thickness measurements confirmed that it was coated with a 10-mil film on either side. The polymer film was observed to be intact, smooth, and pliable. The west end of the pipe had been deformed apparently due to a high load travelling close to the edge of the pipe. No corrosion damage was observed, either in conjunction with the mechanical damage or otherwise.

Conclusions

1. The Trenchcoat polymer is still intact and providing protect on all of the pipes inspected. The film is well adhered, pliable, and did not exhibit any blistering. The galvanizing under the Trenchcoat polymer is still intact. Obviously, the Trenchcoat polymer film has already added over 20 years to the service life of the pipe.
2. The only observed degradation of the Trenchcoat coated pipe was minor undercutting at a few locations. Galvanized steel under delaminated film is in good condition. It is likely that the polymer provides limited protection to corrosion mechanisms (e.g., limits abrasion, limits oxygen access at the surface) even in a loosely bonded state.
3. The performance of these pipes is consistent with the author's observations of Trenchcoat pipes investigated by this author in June, 2000 at Hantz Road in Chippewa County, MI and Charles Moran Road in Mackinac County, MI. The Berrien county pipe performance is also consistent with the author's observations of several hundred Trenchcoat coated pipes throughout the continental United States.

Should you have any questions about any aspect of this report, do not hesitate to contact me at my Ocean City, NJ office.

Sincerely,

J. Peter Ault, P.E.
Senior Engineer

Cc: Mr. Mark Danner
Mr. Bob Mooney