Montana Department of Transportation
Research Programs
March 2015

EXPERIMENTAL PROJECTS CONSTRUCTION REPORT AND ANNUAL EVALUATION

CONTECH® A-2000 POLYVINYL CHLORIDE (PVC) PLASTIC PIPE

Location:	U. S. Highway 12/P-14 (C000014), Meagher County, Butte District
Project Name:	Checkerboard - Martinsdale (CN 4803000)
Project Number:	STPP 14-2(20)63
FHWA Project Number:	MT-4-02
Project Type:	Polyvinyl Chloride (PVC) Irrigation Pipeline Installation
Principal Investigator:	Craig Abernathy, Experimental Project Manager (ExPM)
Date of Installation:	Summer 2012
Date of Inspection:	March 2015

Objective

Determine the effectiveness and long-term durability of the Contech A-2000 PVC pipe in an irrigation application. This type of pipe may prove to be a viable alternative to reinforced concrete pipe (RCP).

Experimental Design

A-2000 is a corrugated PVC plastic pipe with a smooth interior wall that is design for use in storm drain and sanitary sewer applications. Contech Construction Products Inc. manufactures the pipe. Two diameter sizes for three locations were used; 18" (45.7 cm) and 24" (61 cm).

At each of the three locations irrigation water will be piped parallel to the roadway. The following is the layout of the installation plan:

Location #1: size = 24”, type A-2000, Length = 300 ft.
Inlet Station 99+85, offset 61.23 ft. Rt
Outlet Station 102+90.99, offset 86.66 ft. Rt

Location #2: size = 24”, type A-2000, Length = 245 ft.
Inlet Station 107+38.91, offset 70.93 ft. Rt
Outlet Station 109+91.15, offset 68.62 ft. Rt

Location #3: size = 18”, type A-2000, Length = 2,084 ft.
Inlet Station 196+47.44, offset 104.22 ft. Rt
Outlet Station 217+16.93, offset 74.29 ft. Rt

Evaluation Procedures

Research will document the installation for best practice and any constructions concerns germane to the performance of the product. Annual inspections will report on pipe components integrity and any other measurable outcomes. Additional site inspections may supplement the annual visits based on need. District Maintenance will be asked to report on level of upkeep required.

Post Documentation: Will entail annual inspections of outlet, inlet and manhole connection integrity; topical inspection of pipe trench area for signs of leaching or earth displacement due to potential breach of gasket or pipe wall. Currently it is proposed to conduct a video pipe inspection at the thirty-six (36) month mark from installation.

Construction Documentation: will include information specific to the PVC joints; ease of obtaining 2% joint deflections; efficient connection to manholes and headwalls; ease of handling and seal integrity of the gaskets; issues with backfill, floatation, and compaction of the bedding; and overall pipe installation with setting of grade and rate of installation.

The purpose of an experimental features report is to document the phases and events of any given project to gain the reader an understanding of the general activities required to install or incorporate the research element into an active construction or maintenance project. This report also establishes a baseline for defining performance for any given feature under actual service conditions to determine its relative merits.

Initial Remarks and Issues

As reported by the contractor there were no major issues in the placement of either the 18" or 24" A-2000 PVC. The contractor stated on average the rate of installation with the PVC as compared to RCP was estimated at 50% faster. There is the issue of the type of embedment material and procedure specified in the plans which were not

adhered to in the placement of the pipe. The method of what was done is detailed within the report. A video inspection was performed after installation indicating only one small puncture on a section of the 24" line which repaired. No other anomalies were reported.

Starting at page 4 represents the general activities regarding the installation of the 18" (46 cm) A-2000.

Site Inspection April 2013

A site inspection of the 18" (46 cm) A-2000 was conducted on April 2, 2013 by research staff. A walk through of the approximately 2084 ft. length section showed no evidence of visual disturbance on the surface or surrounding area of the irrigation line or the manhole connections. Page 18 of this report has representative images of the April 2013 inspection.

The next site inspection will be conducted in the spring of 2014.

Site Inspection May 2014

A site inspection of the 18" (46 cm) A-2000 was conducted on May 15, 2104 by research staff. A walk through of the approximately 2084 ft. length section showed no evidence of visual disturbance on the surface or surrounding area of the irrigation line or the manhole connections. Page 20 of this report has representative image of the 2014 inspection. District staff has reported no incident involving pipe performance since installation.

The next site inspection will be conducted in the spring of 2015.

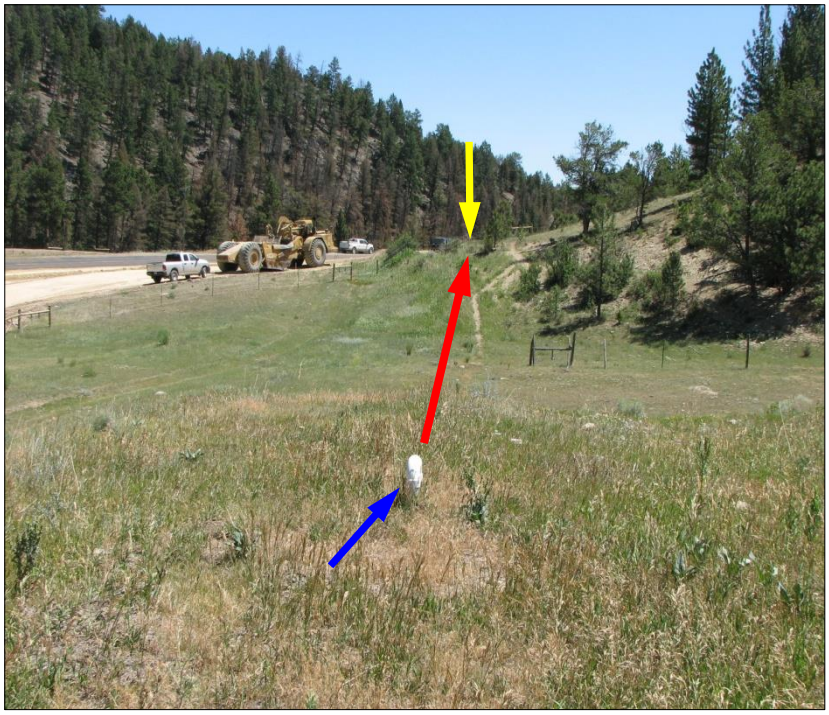
Site Inspection March 2015

Same report as stated in May 2014. Page 21 of this report has representative image of the 2015 inspection. District staff has reported no incident involving pipe performance since installation.

The next site inspection will be conducted in the spring of 2016.

July 2012 – Contech A-2000 18" (46 cm) Installation

Contech A-2000 pipe is delivered on-site



🡸 Image shows the beginning of the 18" A-2000 installation (yellow arrow), view east. The flow runs from west to east.

The red arrow indicates the existing lay of the 15" (38 cm) PVC irrigation line (off ROW).

The white pipe in the image is the irrigation vent tube (blue arrow).

🡹 Above the existing irrigation line is set within the first manhole connection. A robotic total station (RTS) is used to assure correct grade and alignment of the A-2000 pipe as it is placed.

🡅 The first section of the A-2000 is placed (view west).

🡄 The spigot end with the (double sealing surface) gasket is placed on the first two pipe corrugation valleys.

The gasket is shipped separately from the pipe and attached on site.

Note the black ring located approximately one foot from the spigot end (yellow arrow).

When the bell end of the pipe reaches this *home* mark within one corrugation it is seated correctly.

🡅 Close-up of A-2000 gasket: The low height seal (yellow arrow) is inserted into the first corrugation. This double seal design prevents rolling of the gasket as the sections are being connected.

🡇 Prior to the pipe connection gasket lube is liberally applied to the gasket and spigot end.

🡅 Gasket lube is applied to the interior of the bell.

🡇 Using an excavator, the pipe section (22'/6.7 m) is brought to the bell connection point. Also note (red arrow) the contractor is using the excavated fill from the trench to initially place and secure the pipe.

🡅 The workman readies the bell and spigot to be placed ‘home’.

🡇 Initially the contractor placed a wooden beam at the base of the pipe then used the excavator bucket to shove the connection to the proper seat.

🡅 The contractor found using a sling to stab the pipe sections was more efficient.

🡇 Example of a properly homed bell and spigot connection.

🡅 Example image of pipe to manhole installation.

🡇 Interior view of manhole connections.

🡸 Research was unable to capture the grouting procedure of the pipe to the manhole on-site.

This file photo is an example of what a completed grouting will look like (yellow arrow).

🡹 Completed manhole installation.

🡅 Representative image of the completed A-2000 18" installation (view west).

Supplemental Documentation

🡅 Sample image of how pipe sections were shortened on site using a portable saw.

🡇 Damaged pipe are saved and used when shorter sections are required during installation.

Embedment Issue

- As stated earlier in this report, the contractor was using the excavated trench material as fill for the A-2000 pipe. No bedding was prepared or haunching process observed during installation.

  The Contech representative on-site was concerned that there may not be sufficient haunching to insure proper density and side wall support to prevent deflection of the PVC pipe once the fill and compaction was complete.

🡸 In order to determine if using the trenched material as fill, and with the contractors planned method of compaction which may affect the integrity of the pipe, the Contech representative asked if a 20' section of the trench be filled as it would for the entire project to determine if any deflection may be observed. Here the contractor has placed the fill and internal measurements are taken prior to compaction.

🡸 The excavator is used to lower the single drum vibratory roller on top of the filled pipe section.

🡸 The roller makes several passes using both static and dynamic modes to represent how it would be normally done throughout the project.

🡐 A survey stick was cut to several lengths to test if any deflection had occurred after compaction.

In this image the survey stick (affixed to the blade of a shovel) which was measured and cut to detect deflection up to 1.5% (approximately .27"/7mm) of the inside diameter of 18".; is run through the pipe to a depth of approximately 7 ft. No visual indication of deflection was observed.

🡐 This section of survey stick was cut to approximate 18" and run through the pipe in the same manner as indicated in the previous image. No visual deflection was observed.

Note: This was a very simplistic method to test for deflection and representative of a very small fraction of the entire length of the pipe layout and may not be indicative of current or long-term performance of the pipe in this application.

April 2013 Site Inspection

🡅 View east: Start of approximate location at the west end of the 18" A-2000.

🡇 View west: Manhole connection at the existing 15" PVC and 18" A-2000 pipes.

🡅 View west: Start of approximate location at the east end of the 18" A-2000.

🡇 View west: Midway point of the 18" A-2000 section.

May 2014 Site Inspection

🡅 View west: Start of approximate location at the east end of the 18" A-2000.

March 2015 Site Inspection

🡅 View west: Start of approximate location at the east end of the 18" A-2000.

Disclaimer

The use of a product and/or procedure in the course of an evaluation does not constitute an endorsement by the MDT nor does it imply a commitment to purchase, recommend, or specify the product in the future.

Data resulting from an evaluation of a submitted product or procedure is public information and will not be considered privileged. The MDT may, at its discretion, release all information developed during the product evaluation.