Walck Road Sewer Lining Summary Report

Durez NT - Inlet
North Tonawanda, New York
NYSDEC Site No. 932018

Glenn Springs Holdings, Inc.

GHD | 2055 Niagara Falls Boulevard Niagara Falls New York 14304 USA
007405 | Report No 50 | March 2017

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1. Introduction

This Walck Road Sewer Lining Summary Report (Report) presents a summary of the scope of work (SOW) completed for the lining of a portion of the Walck Road Sewer (WRS) System. The SOW was presented in the Walck Road Sewer Lining Work Plan (Work Plan) dated December 23, 2015. The Work Plan was approved by the New York State Department of Environmental Conservation (NYSDEC) in a letter dated December 28, 2015. The WRS System carries storm water from the northeastern portions of the City of North Tonawanda (City) including storm water from the vicinity of the former Occidental Chemical Corporation (OCC) Durez, North Tonawanda facility (Durez NT). The WRS System discharges storm water directly to the Niagara River via its outfall located between Fisherman's Park and the City's Wastewater Treatment Plant. The portion of the WRS System associated with this Report is shown on Figure 1.

2. Background

In August 2007, NYSDEC requested that Glenn Springs Holdings, Inc. (GSH) "undertake an investigation to identify a potential source or sources that could be contributing to the contaminant loading to the Niagara River and evaluate and implement appropriate remedial measures to address the contaminant source(s)" (NYSDEC letter from Mr. Greg Sutton, August 3, 2007). This request was based on 2006 Ontario Ministry of the Environment (MOE) sampling data suggesting that elevated levels of dioxins and furans are still present in sediment within the Pettit Creek Cove (PCC). Subsequent work plans and reports for the Pettit Creek Flume (PCF) sewer system and the PCC posed several hypotheses that could explain the 2006 Ontario MOE sampling data results, including:

- Ongoing source contributions from the PCF
- Overland sediment transport from the surrounding watershed
- Redistribution of residual sediments within the PCC that may not have been removed by the 1995 and/or 2000 dredging actions

In response to the NYSDEC's August 2007 letter, GSH undertook an investigation of both the PCC and the PCF storm sewer system in the summer of 2008. The results of the investigation were presented in the *"Inspection, Sampling, and Flow Monitoring Report – Pettit Creek Flume System and Cove"* (CRA, March 2009). In June 2009, the NYSDEC provided comments to the *"Inspection, Sampling, and Flow Monitoring Report – Pettit Creek Flume System and Cove"*. A component of the comments included a request by the NYSDEC that GSH undertake additional investigation activities to further identify a possible source or sources that could be contributing to the impacts previously identified at the PCC (NYSDEC letter from Mr. Jeff Konsella, June 29, 2009). The requested additional activities included additional sampling within a drainage ditch on the east side of the Site and a video inspection of the PCF and specified laterals from the Durez Site to the PCC. The *"Video Inspection and Sediment Sampling Work Plan – Pettit Creek Flume System"* (CRA, November 2009) for the PCF sewer system was prepared to address this request.

The results of the 2009 investigation were presented in the *"Sediment Sampling and Video Inspection Report – Pettit Creek Flume System"* (CRA, June 2010). A key finding of the investigation activities was that the Walck Road sewer section east of the Walck Road and Nash Road intersection and the Nash Road section of the PCF sewer system north of the intersection of Nash and Walck Roads had been disconnected and rerouted to the WRS System in 1993. It was also determined that at the same time in 1993 as the rerouting of portions of the PCF sewer system to the WRS System, the outfall of the WRS System was relocated from a cove at Fisherman's Park to its current location discharging directly to the Niagara River.

In 2010, based on the recommendations of the 2009 investigation activities report and the NYSDEC's concurrence (September 2010 letter), GSH moved forward with completing repairs to several bulkheads located in the Walck Road sewer adjacent to the south side of the Site and in the Wilson Avenue sewer system. The bulkhead repairs involved reconstructing the bulkheads at each former sewer pipe location to eliminate Site drainage to the storm sewer system.

In June 2012, GSH submitted the *"Operations, Maintenance, and Monitoring Upgrades Site Drainage Improvement Work Plan"* (CRA, January 2013) in response to perceived surface runoff from the Site to areas outside of the Site's security fence. The objective of the drainage improvement Work Plan was to eliminate ponding, reestablish the drainage flow through the ditch by removing obstructions (brush and trees), and to implement Site grading activities to reduce the perception of surface runoff from the Site.

Based on the results of the 2009 investigation of the PCF and with potential overland sediment transport from the surrounding watershed (specifically from Durez NT) corrected, GSH submitted the "*Pettit Creek Flume Sediment Removal Work Plan*" (PCF Cleaning WP) (CRA, August 2013). The field work associated with the PCF Cleaning WP began in October 2013 and was completed in December 2014. The results of the PCF cleaning and drainage improvement activities were summarized in the "*Comprehensive Pettit Creek Flume Sediment Removal Report"* (CRA, April 2015).

In response to the NYSDEC's request to investigate the WRS System, the "*Video Inspection and Sediment Sampling Work Plan, Walck Road Sewer System*" (WRS Work Plan) (CRA, June 2014) was drafted and submitted to the NYSDEC. The field activities conducted in the WRS Work Plan are summarized in the "*Sediment Sampling and Video Inspection Report Walck Road Sewer System"* (WRS Report) (CRA, July 2015). In the WRS Report, it is recommended that the WRS System in the vicinity of the Durez NT Site be rehabilitated to address potential infiltration that could provide a mechanism for any Site-related impacts that could potentially be outside of the sewer piping to enter the storm sewer system. GSH recommended that the sewer pipe and manholes be cured-in-place (CIP) lined extending from Walck MH-1 downstream to the intersection of Walck and Nash Roads (approximately 2,200 linear feet) in order to prevent further infiltration of groundwater or sediments from the sewer bedding.

This Report details the SOW completed to line the WRS adjacent to the Durez Site. The completed WRS System lining now prevents Site-related impacts potentially located outside of the WRS System from infiltrating the WRS System and ultimately being discharged to the Niagara River.

3. Scope of Work

The following activities were presented in the Work Plan as part of the SOW to line the WRS:

- Preparing the sewer, as necessary, for the installation of the lining (i.e., jetting of sewer)
- Cured-in-place pipe (CIPP) lining of an estimated 2,225-linear foot section of the sewer system beginning at Walck MH-1 near the intersection of Zimmerman Street and Walck Road, 100-linear foot section of discharge pipe beginning at the Durez NT water treatment plant, and 11 manholes
- Video inspection and verification of installed lining, reinstatement and sealing of lateral junctions, and the lined interior of each manhole
- Waste management

The completed SOW is summarized in the Sections below.

4. Completed Scope of Work

Arold Construction Company, Inc. (Arold) of Kingston, New York was retained to complete the lining of the WRS System under GHD oversight. A total of 2,422 linear feet of sewer was lined using steam-cured CIPP. Additionally, 13 manholes along the lined section of the WRS were also lined and rehabilitated as necessary. The CIPP liner was installed in accordance with American Society for Testing and Materials (ASTM) Standards F1216 and F1743. Steam curing was used on the CIPP liner and manhole liners. Copies of the photographs of the implementation of the SOW are included in Appendix A.

4.1 WRS Sewer Lining

4.1.1 Pre-lining Inspection

In order to purchase the correct sizes of CIPP liner and CIP manhole liners, it was necessary for Arold to conduct a pre-lining inspection. The purpose of the inspection was to collect accurate measurements of the sewer piping diameters and lengths and to measure and document manhole configurations. Arold also conducted a pre-installation video inspection to assess the condition of the WRS pipe and attempted to video the 8-inch discharge pipe from the Durez NT treatment system.

On May 31, 2016 Arold mobilized a crew to the Site to conduct the pre-lining inspection. The inspection could not be completed at this time due to the video camera system malfunctioning. The video camera was sent out for repair and the pre-installation inspection was rescheduled. Arold remobilized the assessment crew to the Site on June 22 and 23, 2016 and completed the inspection. Based upon the assessment, Arold ordered the appropriate length and diameter of CIPP sewer liner and custom manhole liners.

The pre-lining inspection found the WRS pipe to be generally in good condition with no areas of significant sedimentation. The WRS pipe measurements in the Work Plan were found to be

generally accurate except for the eastern most portions for the WRS System to be lined. Arold's WRS pipe measurements found that the eastern most portion of the WRS System is 30 inches in diameter and not 24 inches as previously thought. The WRS pipe diameters and lengths as measured by Arold are as follows.

- 1,751 feet of 48-inch diameter from Walck MH-13 to Walck MH-3
- 36 feet of 36-inch diameter from Walck MH-3 to approximately 5 feet east of Walck MH-3E
- 635 feet of 30-inch diameter from approximately 5 feet east of Walck MH-3E to Walck MH-2

In addition to collecting the pipe diameter and length measurements, Arold utilized measurements from the video inspection to determine the location of two previously identified buried manholes. These two manholes are identified as Walck MH-8 and Walck MH-6B. Arold uncovered the manhole lids, measured the structures, and ordered the CIP liners. The CIP lining of these two manholes, along with the other WRS System manholes, are described in Section 4.2.

Arold personnel also attempted to video inspect the 8-inch Durez NT discharge pipe with a hand-pushed video camera starting from within the treatment system building. The camera could only be pushed forward approximately 60 feet because of two 45-degree bends in the pipe. Arold then attempted to video the discharge line from the WRS. Video inspection in this direction was not feasible due to the configuration of the discharge pipe's outlet. The Durez NT discharge pipe is further discussed in Section 4.3.

4.1.2 WRS CIPP Lining

The CIPP lining began on August 23, 2016 and ended on October 6, 2016. Arold utilized several crews working simultaneously to facilitate the lining of the WRS.

Removal of Select Manhole Structure Lids

The size of the WRS pipe required CIPP liner sizes that would not fit through the 24-inch metal manhole covers. Therefore, several manholes were selected and the lid of the manhole structure was removed to allow for the liner installation. Arold's road crew conducted the removal of the select manhole lids. The following manhole structure lids were removed to allow for liner installation:

- Walck MH-2
- Walck MH-4
- Walck MH-5
- Walck MH-11

The road crew conducted the road penetrations by saw cutting the asphalt to remove the manhole structure lids (see Appendix A, Photo 1 and Photo 2). Once the saw cut asphalt was removed and the lids of the manhole structure exposed, eyebolts were installed in the lid to act as lift points. The open manhole structures were covered with steel road plates to limit access when work was not being conducted in the manhole. Manholes MH-4, MH-5, and MH-11 were opened following this approach.

Manhole Walck MH-2 is a brick structure and did not have a concrete structure lid to remove (see Appendix A Photo 3). The road crew removed several courses of brick to allow for CIPP liner installation.

During the removal of the lid from manhole Walck MH-4, the lid was found to be in poor condition. Arold's road crew constructed a new lid for manhole Walck MH-4 (see Appendix A, Photo 4). Manhole Walck MH-4 is further discussed in Section 4.2.

WRS Sediment Removal

In order to ensure proper adhesion of the CIPP liner to the WRS pipe, the targeted sections of the WRS System were cleaned prior to repairs. This was accomplished by Arold's jetting crew using a jetter truck equipped with a high-pressure, low-volume water jetter truck to flush the sewers prior to the lining operations. Since the WRS System was previously cleaned and all sewer sediments collected during a comprehensive sewer cleaning event (October 2013-February 2014), all sediment contained in the WRS prior to the CIPP lining was considered typical storm sewer sediment. Therefore, it was not collected and was allowed to be rinsed downstream during the sewer cleaning prior to CIPP lining. But any large debris (e.g., large rocks, bricks, etc.) located within the WRS System was removed by sewer entry.

Installation of the CIPP Liner

Arold's lining crew conducted the installation and curing of the CIPP sewer liner. The CIPP sewer liner consisted of a resin-saturated felt tube manufactured by Mississippi Textiles Corporation (MTC). The resin utilized is 102T resin that is an isophthalic-based polyester resin manufactured by AOC, LLC (AOC). Arold's CIPP lining submittal describing the products used and material safety data sheets (MSDS) for the resin are included as Appendix B.

The CIPP liner was installed in the clean WRS pipe by the following steps:

- The liner, consisting of an inverted, open-ended felt tube that was pre-impregnated with polyester resin, was positioned over the installation manhole.
- Compressed air is used to force the liner down the sewer to the ending manhole.
- The liner ends are sealed off, and the liner is inflated with steam for curing (see Appendix A, Photo 5)
- Once the steam elevates the liner to a minimum temperature of 220° Fahrenheit (F), the curing process begins.
- Curing the liner at the desired temperature (220° F) for a minimum of 1½ hours, based on liner thickness of 12 to 15 millimeters as used on this project. For this project, Arold conservatively held the temperature for 3 hours to ensure the complete cure of the CIPP liner.
- Once curing is complete, the liner ends are cut to reestablish sewer flow (see Appendix A, Photo 6).
- Any functioning laterals sealed during the CIPP installation process are reestablished by cutting the CIPP liner at the lateral.

As shown on Figure 1, the CIPP lining consisted of the installation of 1,751 feet of 48-inch diameter liner from Walck MH-13 to Walck MH-3E; 341 feet of 36-inch diameter liner were installed from between Walck MH-3E and Walck MH-1; and 330 feet of 30-inch diameter liner were installed from Walck MH-1 east to Walck MH-2. It should be noted that the 36-inch diameter section of the WRS is not 341 feet long as suggested by the length of the installed liner. The 36-inch diameter section of the WRS extends approximately 36 feet from Walck MH-3 to just east of Walck MH-3E. The larger 36-inch diameter liner was installed in a portion of 30-inch sewer to simplify the installation and ensure adequate coverage of the junction between the 30-inch and 36-inch diameter sewers.

The following is a table of the sewer laterals that were reinstated.

Size	Distance	Location
8 inch	155 feet east of Walck MH-1	Entering at 2 o'clock
4 inch	155 feet east of Walck MH-1	Entering at 11 o'clock
4 inch	171 feet east of Walck MH-1	Entering at 10 o'clock
4 inch	211 feet east of Walck MH-1	Entering at 10 o'clock
4 inch	80 feet west of Walck MH-1	Entering at 11 o'clock
4 inch	70 feet east of Walck MH-3	Entering at 11 o'clock
4 inch	95 feet west of Walck MH-5	Entering at 9 o'clock
4 inch	57 feet east of Walck MH-6	Entering at 9 o'clock
4 inch	171 feet east of Walck MH-12	Entering at 2 o'clock
4 inch	145 feet west of Walck MH-12	Entering at 1 o'clock
4 inch	145 feet west of Walck MH-12	Entering at 10 o'clock
4 inch	221 feet west of Walck MH-12	Entering at 1 o'clock
24 inch	At Walck MH-3E	Entering at 9 o'clock
24 inch	At Walck MH-3E	Entering at 3 o'clock
24 inch	At Walck MH-3	Entering at 9 o'clock
24 inch	At Walck MH-3	Entering at 3 o'clock
8 inch	At Walck MH-10	Entering at 3 o'clock

4.2 Manhole Lining

Arold's manhole crew completed any necessary structural repair(s) prior to lining and conducted the installation and curing of the CIP manhole basin (manhole) liners. Thirteen manholes were CIP lined. The eastern most manhole (Walck MH-2) and the western most manhole (Walck MH-13) were not CIP lined as part of this project. These two manholes are located at either end of the section of the WRS to be lined, and they are not adjacent to the Durez NT property. Therefore, it was determined that lining of these manholes was not necessary to accomplish the project goals.

The lining procedure for the manhole is generally consistent with the CIPP sewer lining except a closed end "bag" or "sock" was used to line the manhole as opposed to the liner tube used in the sewer pipe (see Appendix A, Photos 7 through 10). The manhole liner bags were manufactured by Terre Hill Composites, LLC (THC) and were constructed of a multiple layer composite consisting of a polyvinyl chloride (PVC) primary layer bonded to a polyester fleece layer. The manhole liner bags were custom made to by THC fit to each manhole based upon Arold's pre-lining inspection

measurements. The liner bags were not supplied impregnated with resin, but instead, Arold personnel covered the manhole liners in resin prior to insertion in the manhole. The resin applied was MultiPlexx Liner Resin developed and provided by THC. Arold's CIP manhole lining submittal describing the products used and MSDS for the resin are included as Appendix C.

Walck MH-4 was the only manhole that required significant structural rehabilitation prior to lining during this project. During the removal of the lid for manhole Walck MH-4, it was determined that the lid was in poor condition. The manhole lid was discarded, and a new lid was constructed by Arold personnel. Walck MH-4 is a concrete structure where the south wall consisted of the exterior of 48-inch WRS pipe. The connection between Walck MH-4 and WRS pipe consisted of an opening cut in the WRS pipe to allow storm water to flow from the manhole to the WRS interior (see Appendix A, Photo 12).

Additionally, on the north wall of Walck MH-4, a 24-inch sewer pipe emanating from Durez NT discharged into this structure. During the current manhole lining activities, an inflatable rubber sewer plug was found to be installed in this pipe (see Appendix A, Photo 12). A minor amount of water was observed to be entering the Walck MH-4 structure from this plugged sewer line. It was concluded that the bulkhead and sewer plug was not providing a watertight seal. Therefore, prior to manhole lining, a concrete bulkhead was installed in the 24-inch sewer pipe entering the Walck MH-4. Once the new concrete bulkhead was installed, the void between the original bulkhead and the new bulkhead was backfilled with the Euco Cable Grout.

Due to the nontraditional shape of the manhole structure, voids were left between the CIP liner and the existing concrete structure. Stimm Associates, Inc. (Stimm) of Buffalo, New York was retained to assist Arold in completing the Walck MH-4 lining/rehabilitation. Stimm pumped a concrete grout mix into these voids to ensure structural stability of the CIP lining and existing manhole structure (see Appendix A, Photo 13). The concrete grout mix used by Stimm was Euco Cable Grout PTX manufactured by Euclid Chemical. Once the manhole rehabilitation was complete and CIP liner was installed, the newly constructed manhole cover was installed, and the surface was restored.

4.3 Durez NT Discharge Pipe

The Work Plan proposed to CIPP line the 8-inch diameter pipe used to discharge treated effluent from the Durez NT water treatment plant to the WRS. The discharge pipe extends from the groundwater treatment system at the Durez NT Site to the WRS System. Prior to this project, it was assumed that the Durez NT discharge pipe's outfall to the WRS was at manhole Walck MH-11. However, the pre-lining inspection conducted by Arold identified that the actual outfall is located within manhole Walck MH-10.

Access to the discharge pipe is limited to connections within the groundwater treatment system building and the outfall within the WRS. Arold personnel attempted to video inspect the discharge pipe with a hand-pushed video camera starting from within the treatment system building. The camera could only be pushed forward approximately 60 feet because of two 45-degree bends in the pipe constricting the camera movement. Arold then attempted to video the discharge line starting in the WRS. Video inspection in this direction was not feasible because the 8-inch discharge line empties into a 24-inch clay tile pipe approximately 25 feet from the WRS. A complete video inspection was not conducted because of the pipe restrictions. The discharge pipe was found to be

constructed of PVC and the limited video inspection indicated that the inspected sections of pipe were in good condition. Based on this information, it was decided that the CIPP lining was unnecessary.

To insure the isolation of the interior of the WRS System from any potential infiltration, the 8-inch discharge pipe at the outfall location was modified by Stimm. This modification consisted extending the 8-inch discharge pipe approximately 25 feet to the WRS System (see Appendix A, Photo 14). To ensure isolation from infiltration, a bulkhead was installed in the 24-inch clay pipe at its junction with the WRS System. This bulkhead was penetrated by the extended 8-inch discharge pipe. The area behind the bulkhead and the annular space between the 24-inch and 8-inch pipes were filled with the Euco Cable Grout utilizing two ports. Once the modification of the Durez NT discharge pipe was complete, automotive type fiberglass body filler was used to seal around the 8-inch discharge pipe and seal the ports used for grouting.

4.4 Site Restoration

The road crew repaired all road penetrations associated with the CIPP lining of the WRS System and associated manhole. This was accomplished by restoring the previously removed manhole lids at manholes Walck MH-4, Walck MH-5, and Walck MH-11. Walck MH-2 was restored by using brick and mortar to replace the removed courses of brick to allow the placement of the metal manhole cover at grade. The manhole rings and covers were replaced to the appropriate grade, crusher run stone was placed and compacted to provide a base for restoring the surface with asphalt.

4.5 Video Inspection

Arold video inspected the WRS both pre- and post-CIPP lining. The pre-lining inspection video was used by Arold to document the need for and effectiveness of cleaning the WRS prior to CIPP installation and to identify lateral locations and size, and to determine/confirm the materials necessary to complete the installation. The post-lining inspection video was to verify the correct installation of the liner, reinstatement of laterals, sealing of junctions, and the lining of the interior of each manhole. Copies of both video inspections are included on a zip drive as Appendix D.

4.6 Management of Waste Materials

No wastewater was generated during the CIPP lining of the WRS. Because of the previous cleaning (summarized in "Comprehensive Pettit Creek Flume Sediment Removal Report" [Report No. 40]), sediment contained in the WRS prior to the CIPP lining was considered nonhazardous, typical storm sewer sediment. The only waste accumulated from this project consisted of general refuse, trimmed pieces of the cured liner (inert and nonhazardous), asphalt, and concrete. These wastes were collected in dumpsters staged at Durez NT and disposed of at a municipal landfill.

SOURCE: NEW YORK STATE GIS CLEARINGHOUSE, 2014 IMAGE DATASET.

LEGEND

PROPERTY LINE

APPROXIMATE LOCATION OF 8-INCH DISCHARGE LINE

figure 1

WALCK ROAD SEWER LINING LOCATION SUMMARY
DUREZ NORTH TONAWANDA DRAINAGE
GLENN SPRINGS HOLDINGS, INC.
North Tonawanda, New York

07405-D23101(050)GN-NI001 MAR 02/2017

Appendices

Appendix A
Photographic Log

Photo 1 Manhole Walck MH-11 structure lid exposed.

Photo 2 Manhole Walck MH-11 structure lid removed.

Site Photographs

Photo 3 Opening of manhole Walck MH-2 structure.

Photo 4 Manhole Walck MH-4 new structure lid.

Photo 5 CIPP liner curing in manhole Walck MH-11.

Photo 6 CIPP liner trimmed in manhole Walck MH-11.

Photo 7 Arold personnel applying resin to manhole liner sock.

Photo 8 Arold personnel preparing to install a manhole liner sock at Walck MH-5.

Site Photographs

Photo 9 Arold personnel setting up to cure a manhole liner sock.

Photo 10 A manhole liner sock steam curing.

Photo 11 View of a completed manhole liner installation.

Photo 12 Manhole Walck MH-4 view north showing rubber sewer plug.

Photo 13 Stimm personnel injecting grout in manhole Walck MH-4 liner/structure voids.

Photo 14 Durez NT discharge pipe extended into the WRS System.

Site Photographs

Photo 15 Durez NT discharge pipe and bulkhead.

Photo 16 Completed Durez NT discharge pipe in Walck MH-10.

Appendix B
Submittal for Cured-in-Place Pipe Lining

AROLD CONSTRUCTION COMPANY, INC.
51 POWDER MILL BRIDGE RD. KINGSTON, NY 12401
(845) 336-8753 PHONE (845) 336-8245 FAX
www.aroldconstruction.com

Submittal
For
CIPP Lining

Installer: Arold Construction Co. Inc
Manufacturer: Mississippi Textile Corporation (MTC)

Walck Road Sewer Lining
North Tonawanda, New York

7/12/2016 **16-028R**

Mississippi Textiles Corporation · 160 Corporate Drive · Batesville, MS 38606
Tel: (662) 578-7797 · Fax: (662) 578-7798 · www.mtubeonline.com

March 7, 2012

To Whom It May Concern:

I am writing this letter to inform you of the benefits of our polypropylene coated liners using the Air Inversion/Steam Cure installation method for cured-in-place pipe (CIPP).

As a wholly owned subsidiary of Insituform Technologies, the global leader in pipeline rehabilitation, Mississippi Textiles Corporation (MTC) is uniquely positioned to offer the most advanced and highest quality products in the industry. As such, our most recent iteration of our standard CIPP product, MTube®, is now made with a polypropylene coating. The reason for this new coating is simple – polypropylene is 50% thicker than conventional coatings and when bonded to our felt, is resistant to hydrolysis and chemical attack. Through extensive product testing at our ISO-9000 manufacturing plant, we have found our polypropylene coating to be superior to the polyurethane coating used by other companies offering trenchless pipeline rehabilitation. Furthermore, our liners typically perform better during the installation process than other companies because ours are designed to handle the higher temperatures and air pressures common to the Air Inversion/Steam Cure installation method.

The Air Inversion Steam Cure installation method, which uses air to invert the CIPP tube and then steam to cure the resin, can reduce the amount of water used during installation by nearly 95 percent. It also produces the same high quality end product in a shortened installation cycle, which reduces the size of the footprint at the manhole, the carbon emissions/fuel needed, the time customers have to limit water and it eliminates grade limitations.

In our first year of service, MTC produced more than 100,000 linear feet of felt tube and since our inception, has supplied more than 5 million linear feet of felt tube to various qualified installers such as Arold Construction of 51 Powder Mill Bridge Road, Kingston, NY 12401, which is experienced in both the recommended CIPP installation methods: Air Inversion/Steam Cure and Water Inversion/Hot Water Cure. Should you have any additional questions, please do not hesitate to contact me at your convenience. I am available at (636) 530-3355 or mwetzel@mtubeonline.com.

Best Regards,

Mark Wetzel
General Manager, MTC

Manufactured Technologies Corporation
17988 Edison Avenue ▪ St. Louis, MO 63005
(636) 530-3330 ▪ manufacturedtechnologies.com

June 15, 2015

RE: CERTIFICATE OF COMPLIANCE FOR MTUBE®

To Whom It May Concern,

This letter is to certify that Manufactured Technologies Corporation (MTC), a subsidiary of Insituform Technologies, LLC, was established as a business in 2005 and has been supplying the cured-in-place-pipe (CIPP) industry with liner material since 2006. During this time, MTC has supplied nearly 10 million linear feet of CIPP liner to contractors across North America and beyond.

All of our felt tubes are manufactured and wet out in an ISO:9001:2008 certified factory in accordance with MTC specifications and will comply with the guidelines of ASTM F1216 and ASTM F1743. Most commonly, our liners are impregnated with polyester resin, which is produced by industry leading suppliers, including but not limited to: AOC and Interplastic Corporation. Our resin systems have a successful history in lab conditions and actual field installations of meeting the chemical resistance recommendations of ASTM F1216, ASTM F1743 and ASTM D5813.

The following physical properties are recommended for CIPP design when using a polyester resin system:

Flexural Modulus of Elasticity……400,000 psi
Flexural Strength ……..4,500 psi
*Tensile Strength ……2,500 psi
Flexural Modulus Reduction to Account
For Long-Term Effects……50%

* As stated in ASTM F1216, tensile strength is not a parameter that is used in standard gravity flow design.

Temperature and pH ranges typical for polyester resin: up to 140 degrees Fahrenheit and pH between 0.5 to 10.5.

The above values were derived from samples tested in accordance with modified ASTM D790. If you should have any additional questions, please do not hesitate to contact me at your convenience. I am available at (636) 530-3355 or mwetzel@mtcmail.com.

Best regards,

Mark Wetzel
General Manager, MTC

Leading CIPP Supplier

MTC™
MISSISSIPPI TEXTILES CORP.

Mississippi Textiles Corporation
160 Corporate Drive
Batesville, MS 38606
Phone: 662-578-7797

www.mtubeonline.com

Mississippi Textiles Corporation was formed in 2005 to provide high-quality, affordable CIPP to the trenchless rehabilitation industry.

Today, MTC serves as a single-source supplier for a variety of domestic and international contractors. Our commitment to premium raw materials, state-of-the-art manufacturing and exceptional customer service makes us the most reliable and complete choice for your CIPP needs.

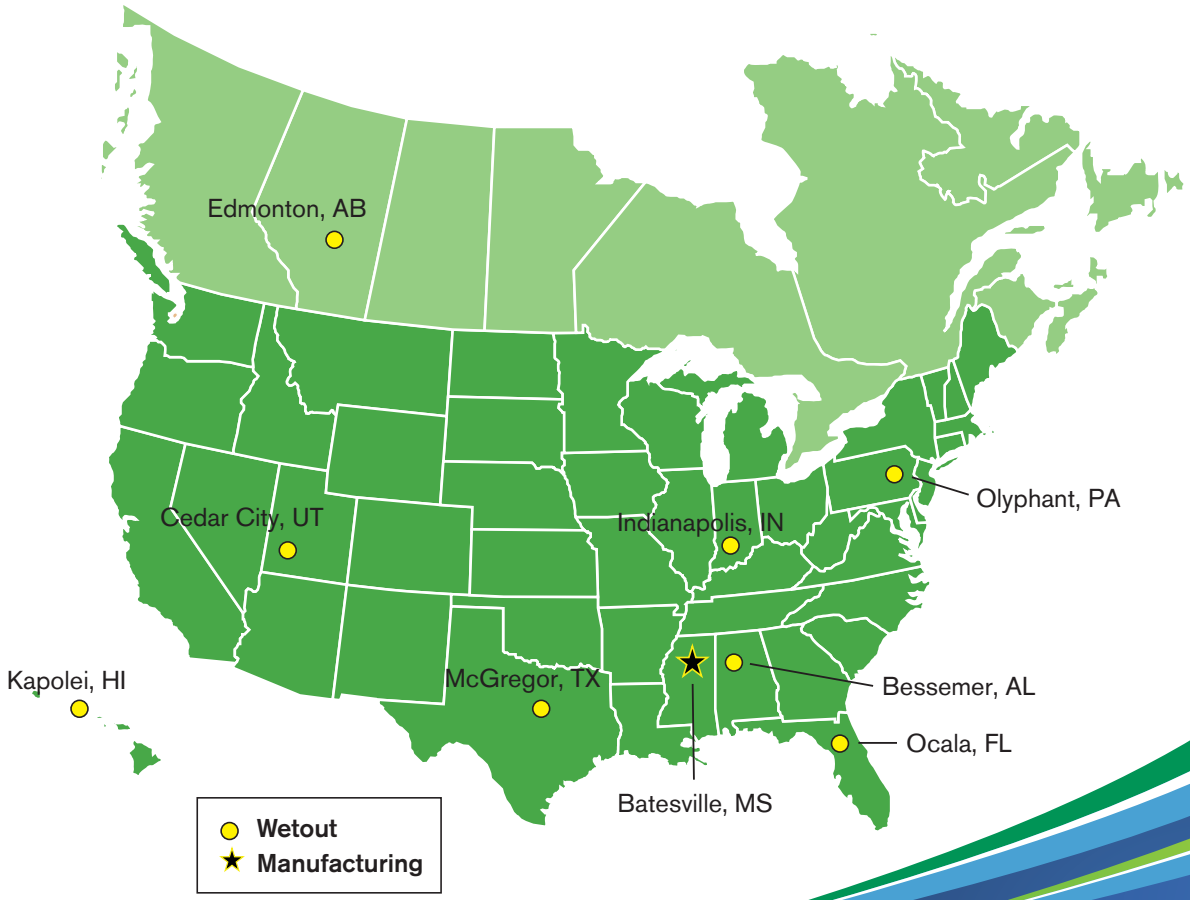
With multiple wetout facilities across North America, we are ready to serve you at any jobsite location. This unique footprint allows us to conveniently wet out tube where and when you need it.

Benefits

- Premium raw materials
- Superior product uniformity
- Leading technical support
- Affordable, fixed pricing
- Multiple wetout facilities
- Flexible pipe design
- 6-inch to 96-inch diameter tubes
- Sewn-seam construction
- Tapers / Transitions
- Water or Steam Cure

Applications

- Sanitary and storm sewers
- Industrial effluent
- Cooling water pipelines
- Outfalls



Lower costs and raise quality on your next project

Mississippi Textiles Corporation
160 Corporate Drive
Batesville, MS 38606
Phone: 662-578-7797

www.mtubeonline.com

Quality and Convenience

We construct our tubes for optimal installation and long-term performance. During the manufacturing process, MTube® undergoes more than 25 stringent quality checks for weight, thickness, density, strength and elongation — resulting in a product with superior uniformity.

Backed by more than 40 years of industry expertise, we provide our customers with operational and technical support, including field assistance and submittal data.

State-of-the-art manufacturing facilities ensure MTube® is constructed and wet out for optimal installation and long-term performance.

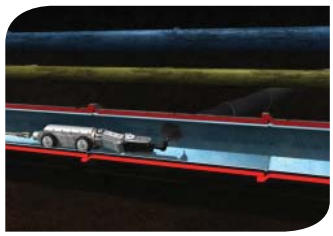
MTube® CIPP Process

Since 1971, CIPP has been used to rehabilitate over 25,000 miles of pipelines worldwide. A structural solution, MTube® is a resin-saturated felt tube that is typically inserted into an existing wastewater pipeline through manholes.

Once it is in place, it is cured using hot water or steam. Service laterals can be reinstated internally using a robotic cutter. Compared to open trench replacement methods, MTube® is a significantly less intrusive and more cost-effective solution for installing a new pipe with a 100-year design life.

Step 1:
A resin-saturated, coated felt tube is inverted (shown) or pulled into a damaged pipe.

Step 2:
Hot water or steam is used to cure the resin and form a tight-fitting, joint-less and corrosion resistant pipe.



Step 3:
Service laterals are typically restored internally with robotically controlled cutting devices and the rehabilitated pipe is inspected by closed-circuit TV.

Quality on Demand

MTube® is the industry's highest quality cured-in-place pipe (CIPP) tube, ready when you need it.

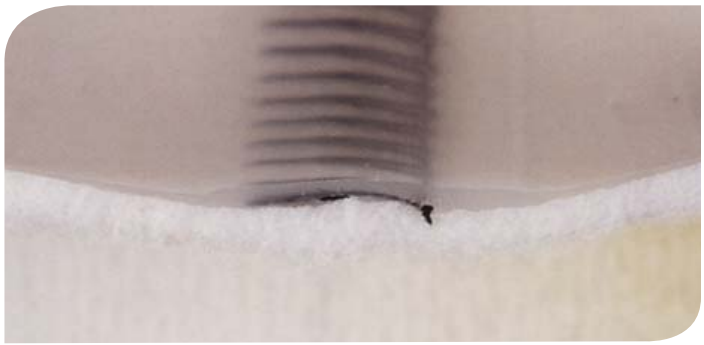
Every CIPP project you undertake has its share of challenges and unexpected obstacles. When you order MTube® for your projects, you can be assured that you are getting the highest quality felt tubes available on the market and that you are getting them on your schedule. Our tubes are specially manufactured to accommodate your installation method whether you use water or steam inversion. MTube® will also handle the unique demands of steam cure.

We understand what it takes to consistently produce high quality MTube®. Over 30 years of experience and state-of-the-art manufacturing techniques ensure that our MTube® are constructed for optimal installation and long-term performance.

MTube® are manufactured from premium quality raw materials. The raw synthetic fibers we select to make our MTube® must pass our exacting standards for quality. We then put our MTube® through more than 25 stringent quality checks for weight, thickness, density, strength and elongation. The result is an MTube with superior uniformity.

Premium CIPP tube available wet or dry.

State-of-the-art ISO certified manufacturing techniques ensure that MTube® are constructed and wet-out for optimal installation and long-term performance.



The heat-bonded coating over the seam seals the stitching and creates a permanent connection at the butt-sewn seam joint.

The butted ends of our felt are sewn together. Experience has shown that the strongest tubes are made with butt-sewn seams. The uncoated, butt-sewn seam provides the required strength and produces a smooth, uniform pipe wall around the full circumference of the tube.

A heat-bonded coating is extruded over the seam. Extruding hot coating onto the butt-sewn joint seals the outer seams of our MTube®. This seals the stitching and creates a permanent connection at the butt-sewn seam joint.

MTubeTM are available in 6- to 96-inch diameters. We produce our MTube® to meet your schedules and deadlines. When you encounter the unexpected, you'll appreciate our ability to react to short lead times.

Get your next CIPP project off to a great start, order high-quality MTube® from MTC.

For Quality on Demand, call us at 877-MTC-TUBE (877-682-8823).

MTube® Specifications for Cured-In-Place Pipe

1. INTENT

1.1 This document provides specifications for the tube products used in the reconstruction of pipelines and conduits. Proper installation of a resin-impregnated flexible tube produces a tight forming product within the original conduit. The resin is cured using either hot water under hydrostatic pressure or steam pressure within the tube. The Cured-In-Place Pipe (CIPP) will be continuous and permanently fixed within the original pipe.

1.1.1 As installation conditions and experience and techniques differ greatly, Mississippi Textiles Corporation (MTC) excludes any warranty of any kind, express or implied, with respect to the goods sold hereunder as to merchantability, fitness for a particular purpose or any other matter with respect to the goods whether used alone or in combination with other products. MTC has not provided any design specifications; accordingly, MTC does not warrant the design.

2. REFERENCED DOCUMENTS

This specification references standards from the American Society for Testing and Materials, such as: ASTM F1216 (Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube) and ASTM F1743 (Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)), which are made a part hereof by such reference and shall be the latest edition and revision thereof.

3. MATERIALS

3.1 Tube - The sewn Tube shall consist of one or more layers of absorbent non-woven felt fabric and shall meet the requirements of ASTM F1216, Section 5.1 or ASTM F1743, Section 5.2.1.

3.1.1 The Tube shall be manufactured to a size, as specified by the customer. Allowance should be made for circumferential stretching during inversion. Overlapped layers of felt in longitudinal seams that cause lumps in the final product shall not be utilized.

3.1.2 The outside layer of the Tube shall be coated with an impermeable, flexible membrane that will contain the resin and allow the resin impregnation (wet out) procedure to be monitored.

3.1.3 The Tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the Tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident in the wet out tube.

3.1.4 The wall color of the interior pipe surface of CIPP after installation shall be a relatively light, reflective color so that a clear examination with closed circuit television inspection equipment may be made.

3.1.5 Seams in the Tube shall be stronger than the non-seamed felt material.

3.2 Resin - The resin system shall satisfy the requirements of ASTM F1216 and ASTM F1743. The resin system shall produce a CIPP that will comply with the structural and chemical resistance requirements of the relevant ASTM standards.

4. STRUCTURAL REQUIREMENTS

4.1 The CIPP shall be designed by the customer as per ASTM F1216, Appendix X.1.

5. INSTALLATION

Tube Design, Installation and Cool Down shall be performed by the contractor in accordance with ASTM F1216 or ASTM F1743.

5.1 CIPP installation shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6.

5.1.2 Curing is accomplished by utilizing hot water under hydrostatic pressure or pressurized steam in accordance with the resin manufacturer's recommended cure schedule.

5.1.3 Cool down shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6.

MTC™
MISSISSIPPI TEXTILES CORP.

Mississippi Textiles Corporation
160 Corporate Drive
Batesville, MS 38606
Phone: 662-578-7797

www.mtubeonline.com

CERTIFICATE OF REGISTRATION

This is to certify that

Insituform Technologies, LLC

Headquarters
17988 Edison Avenue, Chesterfield, Missouri 63005 USA

Refer to Attachment to Certificate of Registration dated March 13, 2014 for additional certified sites

operates a

Quality Management System

which complies with the requirements of

ISO 9001:2008

for the following scope of registration

Design, development, manufacturing and installation of products for the rehabilitation of pipelines using trenchless technology.

Certificate No.:	CERT-0078079	Original Certification Date:	February 11, 2014
File No.:	1650845	Current Certification Date:	March 8, 2014
Issue Date:	March 13, 2014	Certificate Expiry Date:	March 7, 2017

Chris Jouppi
President,
QMI-SAI Canada Limited

Samer Chaouk
Head of Policy, Risk and Certification

Certified System ™
ISO 9001

ANAB ACCREDITED

ATTACHMENT TO
CERTIFICATE OF REGISTRATION

These sites are registered under Certificate No: CERT-0078079 issued on March 13, 2014

File No.		Effective Date
1650845	**Insituform Technologies, LLC** **Headquarters** 17988 Edison Avenue, Chesterfield, Missouri 63005 USA Design, development, manufacturing and installation of products for the rehabilitation of pipelines using trenchless technology.	March 8, 2014
1650847	**Insituform Technologies, LLC** **R & D** 17999 Edison Ave., Chesterfield, Missouri USA Design & Development, Applications Engineering, validation/testing, video	March 8, 2014
1650848	**Insituform Technologies, LLC** **Wetout** 7605 18th Street, Edmonton, Alberta T6P 1N9 Canada Manufacturing.	March 8, 2014
1650849	**Insituform Technologies, LLC** **Wetout** 912 Stanton Road, Olyphant, Pennsylvania 18447 USA Manufacturing.	March 8, 2014
1650850	**Insituform Technologies, LLC** **Wetout** 468 Cypress Road, Ocala, Florida 34472 USA Manufacturing.	March 8, 2014
1650851	**Insituform Technologies, LLC** **Wetout** 2255 West 85th North, Cedar City, Utah 84721 USA Manufacturing.	March 8, 2014
1650852	**Insituform Technologies, LLC** **Installation East** 1860 Freeman Parkway, Mableton, Georgia 30126 USA Preparation and Installation.	March 8, 2014

These registrations are dependent on Insituform Technologies, LLC Headquarters (File No. 1650845) maintaining their scope of registration to ISO 9001:2008

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1650853	**Insituform Technologies, LLC** **Installation West** 9654 Titan Court, Littleton, Colorado 80125 USA Preparation and Installation.	March 8, 2014
1650854	**Insituform Technologies, LLC** **Manufacturing** 160 Corporate Drive, Batesville, Mississippi 38606 USA Manufacturing.	March 8, 2014
1650855	**Insituform Technologies, LLC** **Wetout** 2130 Stout Field West Drve, Indianapolis, Indiana 46241 USA Manufacturing.	March 8, 2014
1650856	**Insituform Technologies, LLC** **Wetout** 3061 Dublin Circle, Bessemer, Alabama 35022 USA Manufacturing.	March 8, 2014
1650857	**Insituform Technologies, LLC** **Wetout** 6526 Bluebonnet Parkway, McGregor, Texas 76657 USA Manufacturing.	March 8, 2014
1650858	**Insituform Technologies, LLC** **Wetout** 91-255 Kalaeloa Boulevard, Kapolei, Hawaii 96707 USA Manufacturing.	March 8, 2014
1650859	**Insituform Technologies, LLC** **Installation Central** 580 Goddard Avenue, Chesterfield, Missouri 63005 USA Preparation and Installation.	March 8, 2014

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1650860	**Insituform Technologies, LLC** **Installation Canada** 5743 - 68 Avenue NW, Edmonton, Alberta T6B 3P8 Canada Preparation and Installation.	March 8, 2014
1650863	**Insituform Technologies, LLC** **Installation - Eastern Region** 707 E. Ordinance Road, Baltimore, Maryland USA Preparation and Installation.	March 8, 2014
1650864	**Insituform Technologies, LLC** **Installation - Eastern Region** 253 B Worcester Road, Charlton, Massachusetts USA Preparation and Installation.	March 8, 2014
1650865	**Insituform Technologies, LLC** **Installation - Eastern Region** 3898 Welden Drive, Lebanon, Ohio USA Preparation and Installation.	March 8, 2014
1650866	**Insituform Technologies, LLC** **Installation - Eastern Region** 6972 Business Park Blvd., Jacksonville, Florida USA Preparation and Installation.	March 8, 2014
1650867	**Insituform Technologies, LLC** **Installation - Eastern Region** 12155 NW 28th Avenue, Miami, Florida USA Preparation and Installation.	March 8, 2014
1650868	**Insituform Technologies, LLC** **Installation - Eastern Region** 1819 John Moore Rd., Monroe, North Carolina USA Preparation and Installation.	March 8, 2014

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1650869	**Insituform Technologies, LLC** **Installation - Eastern Region** 3016 U.S Highway 301 N., Suite 900, Tampa, Florida USA Preparation and Installation.	March 8, 2014
1650870	**Insituform Technologies, LLC** **Installation - Eastern Region** 3061 Dublin Circle, Bessemer, Alabama 35022 USA Preparation and Installation.	March 8, 2014
1650871	**Insituform Technologies, LLC** **Installation - Eastern Region** 168 Warehouse Drive, Buda, Texas USA Preparation and Installation.	March 8, 2014
1650872	**Insituform Technologies, LLC** **installation - Eastern Region** 5033 Mosson Rd., Fort Worth, Texas 76119 USA Preparation and Installation.	March 8, 2014
1650873	**Insituform Technologies, LLC** **Installation - Eastern Region** 795 S. Morrison Blvd., Hammond, Louisiana USA Preparation and Installation.	March 8, 2014
1650874	**Insituform Technologies, LLC** **Installation - Eastern Region** 13502 Almeda School Road, Houston, Texas 77047 USA Preparation and Installation.	March 8, 2014
1650876	**Insituform Technologies, LLC** **Installation - Eastern Region** 1410 Gould Blvd, LaVergne, Tennessee USA Preparation and Installation.	March 8, 2014

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These sites are registered under Certificate No: CERT-0078079 issued on March 13, 2014

1650877	**Insituform Technologies, LLC** **Installation - Western Region** 1400 E. Orangethorpe Ave., Fullerton, California USA Preparation and Installation.	March 8, 2014
1650878	**Insituform Technologies, LLC** **Installation - Western Region** 8620 Antelope N. Rd. - Ste 1, Antelope, California USA Preparation and Installation.	March 8, 2014
1650879	**Insituform Technologies, LLC** **Installation - Western Region** 2400 W. Medtronic Way - Ste. 1, Tempe, Arizona USA Preparation and Installation.	March 8, 2014
1650880	**Insituform Technologies, LLC** **Installation - Western Region** 91-255 Kalaeloa Blvd., Kapolei, Hawaii USA Preparation and Installation.	March 8, 2014
1650881	**Insituform Technologies, LLC** **Installation - Western Region** 17220 Bel Ray Place, Belton, Missouri USA Preparation and Installation.	March 8, 2014
1650882	**Insituform Technologies, LLC** **Installation - Western Region** 1088 Victory Drive, Howell, Michigan USA Preparation and Installation.	March 8, 2014
1650883	**Insituform Technologies, LLC** **Installation - Western Region** 11351 W. 183rd, Orland Park, Illinois USA Preparation and Installation.	March 8, 2014

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These sites are registered under Certificate No: CERT-0078079 issued on March 13, 2014

1650884	**Insituform Technologies, LLC** **Installation - Western Region** 1177 Birch Lake Blvd. N., White Bear Lake, Minnesota USA Preparation and Installation.	March 8, 2014
1650885	**Insituform Technologies, LLC** **Installation - Western Region** 2130 Stout Field West Drive, Indianapolis, Indiana USA Preparation and Installation.	March 8, 2014
1650886	**Insituform Technologies, LLC** **Installation - Canadian Region** 4420 - 50 Avenue SE, Calgary, Alberta Canada Preparation and Installation.	March 8, 2014
1650887	**Insituform Technologies, LLC** **Installation - Canadian Region** 139 rue Barr, Montreal, Québec Canada Preparation and Installation.	March 8, 2014
1650888	**Insituform Technologies, LLC** **Installation - Canadian Region** 3 Burford Rd., Hamilton, Ontario Canada Preparation and Installation.	March 8, 2014

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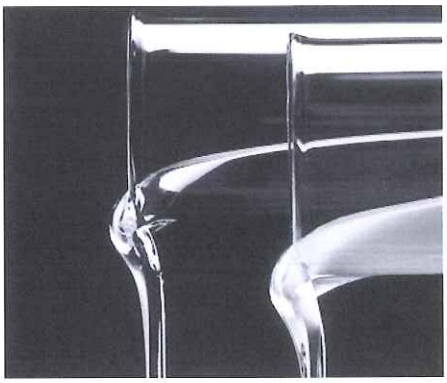
AOC
World Leader in Resin Technology

102 T/TA Filled Polyester Resin

Product Information

Isophthalic Based Resin for Underground Sewer Pipe Liners



TYPICAL LIQUID RESIN PROPERTIES

	Nominal	Test Method
Flexural Strength, psi/MPa	4,500/31.5	ASTM D 790
Flexural Modulus, psi/GPa	400,000/2.7	ASTM D 790

***Typical properties are not to be construed as specifications.**

DESCRIPTION

AOC's 102 T/TA Filled is a high molecular weight isophthalic unsaturated polyester resin that was developed for Insituform Technologies, Inc. and their licensees. 102 T/TA Filled provides the corrosion resistance, durability and toughness that is required in this demanding application. Using recommended catalyst systems and temperatures, up to 50 hours of catalyzed pot life may be obtained. 102 T/TA Filled thixotropic properties reduce resin pooling while providing superior PET felt wet-out.

FEATURES

- Excellent catalyzed pot life
- Superior mechanical properties
- High molecular weight
- High heat distortion tempature

APPLICATION

- Sewer pipe liners

PERFORMANCE GUIDELINES

Consistent shop conditions contribute to consistent gel times.

STORAGE STABILITY

Resins are stable for three months from date of production when stored in the original containers away from sunlight at no more than 70°F/21°C. After extended storage, some drift may occur in gel time. During the hot summer months, no more than two months stability at 86°F/30°C should be anticipated.

SAFETY

See appropriate Material Safety Data Sheet for guidelines.

ISO 9001:2008 CERTIFIED

The Quality Management Systems at every AOC manufacturing facility have been certified as meeting ISO 9001:2008 standards. This certification recognizes that each AOC facility has an internationally accepted model in place for managing and assuring quality. We follow the practices set forth in this model to add value to the resins we make for our customers.

AOC
World Leader in Resin Technology

North America
northamerica@aoc-resins.com
Toll Free: +1 (866) 319-8827
www.aoc-resins.com

Global Contacts

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australia@aoc-resins.com
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middleeast@aoc-resins.com
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europe@aoc-resins.com

Effective Date: May 2010

AOC
World Leader in Resin Technology

May 23, 2012

To Whom It May Concern:

The following cure procedures are recommended when using the 102T or 102N polyester resin in Cured In Place Pipe applications.

102T or 102N polyester resin can be cured using either hot water or steam. The recommended post cure temperatures are a minimum of 180°F for water cures and 220°F for steam cures.

Recommended post cure times, interface temperatures, and minimum cool down times are listed in the table below. Note that the shorter cure times can be used in some cases based on achieving a higher interface temperature. For steam cure on liners greater than 400 ft add a minimum of 0.5 hrs to the corresponding minimum hold time.

Liner Thickness	Water Cure Hold time	Steam Cure Hold Time	Min. Interface Temperature	Minimum Cool Down
< 10.5 mm	3 hr	1.5 hr	130°F	½ hr
< 10.5 mm	2.5 hr	1 hr	150°F	½ hr
10.5 to18 mm	3 hr	2 hr	130°F	¾ hr
10.5 to18 mm	3 hr	1.5 hr	150°F	¾ hr
19.5 to 30 mm	4 hr	3 hr	120°F	2 hr
> 30 mm	5 hr	4 hr	110°F	4 hr

Additional cure time is recommended in very cold or very wet conditions. Interface temperatures should be monitored. If interface temperatures or water / steam temperatures are low, additional cure time is recommended. If the pipe to be lined contains a bituminous coating, the use of a pre-liner is recommended.

The liner shall be cooled to a minimum of 100°F using the minimum cool down period listed in the table above.

Bill Moore
AOC, LLC
Product Leader - CIPP

This information is correct to the best of our knowledge; however, because of unforeseen variations in the field conditions and curing systems beyond our control, we cannot guarantee performance.

WHMIS (Canada)	NFPA (USA)	HMIS (USA)	Protective clothing
 B-2 D-2A D-2B	 Fire: 3; Health: 2; Reactivity: 2; Specific hazard	Health hazards * 2 Flammability 3 Physical hazards 2 Personal protection X	

Section 1. Chemical product and company identification

Trade name	**102T**
Product type	Polyester Resin Solution
Chemical family	Aromatic.
Material uses	Used in the manufacture of thermoset plastic parts.

Manufacturer

AOC, LLC
950 Highway 57 East
Collierville, TN U.S.A. 38017
Website: www.aoc-resins.com
Phone Number: (901) 854-2800
8am-5pm (Central Time) Mon-Fri

In case of emergency

CHEMTREC (US): 24 hours/7 days (800) 424-9300
CANUTEC (Canada): 24 hours/7 days (613) 996-6666

Section 2. Hazards identification

OSHA status	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Routes of entry	Eye contact, Skin contact, Inhalation, Ingestion
Potential acute health effects	**Eyes:** Severe eye irritant which may result in redness, burning, tearing and blurred vision. **Skin:** Skin irritant which may result in burning sensation. Repeated or prolonged skin contact may cause dermatitis. **Ingestion:** Ingestion may result in mouth, throat and gastrointestinal irritation, nausea, vomiting and diarrhea. **Inhalation:** Inhalation of spray mist or liquid vapors may cause upper respiratory irritation and possible central nervous system effects including headaches, nausea, vomiting, dizziness, drowsiness, loss of coordination, impaired judgement and general weakness.
Potential chronic health effects	**CARCINOGENIC EFFECTS:** Styrene: Classified A4 (not classifiable for human or animal) by ACGIH. Classified 2B (possible for human) by IARC. An increased incidence of lung tumors was observed in mice from a recent inhalation study. The relevance of this finding is uncertain since data from other long-term animal studies and from epidemiology studies of workers exposed to styrene do not provide a basis to conclude that styrene is carcinogenic to humans. Lung effects have been observed in mouse studies following repeated exposure. Talc: Classified A2 (suspected for human) by ACGIH. Classified 1 (proven for human) by IARC. Classified 1 (known) by NTP. Crystalline Silica: Classified A2 (suspected for human) by ACGIH. Classified 1 (proven for human) by IARC. Classified 1 (known) by NTP. **MUTAGENIC or TERATOGENIC EFFECTS:** No known effect according to our database.

Section 3. Composition/information on ingredients

Name	CAS #	% by weight
1) Styrene	100-42-5	28.8
2) Talc	14807-96-6	20 - 30
3) Crystalline Silica	14808-60-7	0.1 - 1

Section 4. First aid measures

Eye contact	Flush with a continuous flow of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Use of buffered baby shampoo will aid in removal. Seek medical attention.
Skin contact	Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. If irritation persists, seek medical attention.
Inhalation	Move the victim to a safe area as soon as possible. Allow the victim to rest in a well-ventilated area. If breathing is difficult, give oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.
Ingestion	Do not induce vomiting. Seek immediate medical attention.

Section 5. Fire fighting measures

The product is:	Flammable liquid, Class IC.
Auto-ignition temperature	914°F (490°C) Styrene
Flash point	87.6°F (31°C)Styrene
Flammable limits	**Lower:** 0.9% **Upper:** 6.8% (Styrene)
Products of combustion	May produce carbon monoxide, carbon dioxide, and irritating or toxic vapors, gases or particulate.
Fire hazard	Flammable in the presence of open flames, sparks, or heat.
Explosion hazard	Can react with oxidizing materials. Explosive in the form of vapor when exposed to heat or flame. Material may polymerize when container is exposed to heat (fire) and polymerization will increase pressure in a closed container which may cause the container to rupture violently.
Fire-fighting media and instructions	SMALL FIRE: Use carbon dioxide, foam, dry chemical or water fog to extinguish. LARGE FIRE: Evacuate surrounding areas. Use carbon dioxide, foam, dry chemical or water fog to extinguish. Wear self-contained breathing apparatus (SCBA) and full fire-fighting protective clothing. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. Prevent run off to sewers or other water ways.

Section 6. Accidental release measures

Small spill	Absorb with an inert material and place in an appropriate waste disposal container.
Large spill	Stop leak if without risk. Eliminate all ignition sources. Contain with an inert material, recover as much as possible and place the remainder in an appropriate waste disposal container. Warn unauthorized personnel to move away. Prevent entry into sewers or confined areas.

Section 7. Handling and storage

Handling	WARNING! Use only in well-ventilated areas. Store away from direct sunlight. Avoid inhalation and contact with eyes, skin, and clothing. Wear appropriate personal protective equipment for your task. Ground and bond all containers when transferring the material. Empty containers may retain product and product vapor. Do not expose to heat, flame, sparks or other ignition sources such as cutting, welding, drilling, grinding or static electricity. Do not pressurize. Provide adequate safety showers and eyewashes in the area of use. Note: If product contains metal compounds (Section III), avoid dust from dried product or grinding of articles made from this material.
Storage	Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Containers should be grounded.

Section 8. Exposure controls/personal protection

Exposure limits	Styrene	**OSHA PEL (United States).** TWA: 100 ppm TWA: 426 mg/m³ **ACGIH TLV (United States).** TWA: 20 ppm TWA: 85 mg/m³
	Talc	**ACGIH TLV (United States, 1/2007).** TWA: 0.1 F/cc 8 hour(s). **NIOSH REL (United States, 12/2001).** TWA: 2 mg/m³ 10 hour(s). Form: Respirable fraction **OSHA PEL 1989 (United States, 3/1989).** TWA: 2 mg/m³ 8 hour(s). Form: Respirable dust **OSHA PEL Z3 (United States, 9/2005).** STEL: 1 f/cc 30 minute(s). Form: not containing asbestos TWA: 20 mppcf 8 hour(s). Form: not containing asbestos
	Crystalline Silica	**OSHA PEL (United States).** TWA: 0.1 mg/m³ 8 hour(s). **ACGIH TLV (United States).** TWA: 0.025 mg/m³ 8 hour(s).
Engineering controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective occupational exposure limits. Provide adequate safety showers and eyewashes in the area of use.	
Personal protection	Personal protective equipment may vary depending on the job being performed. **Eye/Face:** Wear eye protection such as safety glasses with side shields, splash goggles or face shield with safety glasses. **Skin:** Avoid skin contact. Impervious gloves should be worn. Other items may include long sleeves, lab coats, or impervious jackets. **Respiratory:** Determine if airborne concentrations are below the recommended exposure limits in accordance your company's PPE program and regulatory requirements. If they are not, select a NIOSH-approved respirator that provides adequate protection from the concentration levels encountered. Air-purifying respirators are generally adequate for organic vapors. Use positive pressure, supplied-air respirators if there is potential for an uncontrolled release, if exposure levels are unknown, or under circumstances where air-purifying respirators may not provide adequate protection. Reference OSHA 29 CFR 1910.134	
Personal protection in case of a large spill	Chemical resistant gloves, full protective suit, and boots. Respiratory protection in accordance with OSHA regulation 29 CFR 1910.134. A self-contained breathing apparatus should be used to avoid inhalation of the product vapors.	

Section 9. Physical and chemical properties

Physical state	Liquid.
Color	Grey-Hazy
Odor	Aromatic.
Molecular weight (g/mol)	1000 to 15000

Section 9. Physical and chemical properties

Boiling point	293°F (145°C) Styrene
Melting point	Not available.
pH (1% soln/water)	Not applicable.
Vapor pressure	4.5 mm Hg @ 68°F (20°C) Styrene
Vapor density	3.59 Styrene (Air = 1)
Specific gravity	1.1 to 1.4 (Water = 1)
Water/oil dist. coeff.	Not available.
Evaporation rate	Not available.
Odor threshold	0.14 ppm Styrene
Solubility in water	Slight.
Dispersibility properties	Not dispersed in water.

Section 10. Stability and reactivity

Stability	This product is normally stable, but can become unstable at elevated temperatures and undergo polymerization, which could produce heat and fumes resulting in over-pressurization and rupture in a closed container.
Instability temperature	>170°F (77°C)
Conditions of instability	Heat.
Incompatibility with various substances	Polymerizes in the presence of organic peroxides, oxidizing materials, or heat.
Corrosivity	Our database contains no additional remark on the corrosivity of this product

Section 11. Toxicological information

Toxicity to animals

Name	Result	Species	Dose	Exposure
Styrene	LD50 Oral	Rat	2650 mg/kg	-
	LC50 Inhalation Vapor	Rat	5634.2 ppm	4 hours
Crystalline Silica	LD50 Oral	Rat	500 mg/kg	-

Special remarks on toxicity to animals	Lung effects have been observed in mouse studies following repeated exposure.
Special remarks on chronic effects on humans	No additional remark.
Special remarks on other toxic effects on humans	**Talc**: Exposure to dusts containing talc can be toxic and can produce acute and chronic effects. Contact with dusts may irritate the eyes. Breathing dust may irritate the nose and throat and cause coughing and chest discomfort. There are reports that relatively mild pneumoconiosis can develop after years of occupational exposure to mixed dusts containing talc. Prolonged inhalation may also produce a fibrotic response.

Section 12. Ecological information

Ecotoxicity	Toxic to aquatic organisms. Should not be released to sewage system or other bodies of water at concentrations above limits established in regulations or permits.

Section 13. Disposal considerations

Waste disposal	Recycle to process, if possible. Consult your local or regional authorities. Ignitable characteristic.

Section 14. Transport information

DOT	UN1866; Resin Solution; 3; III.	**Labels** 
TDG	UN1866; Resin Solution; 3; III.	
IATA/IMDG	IATA: UN1866; Resin Solution; 3; III; Pkg. Inst.: Passenger - 309; Cargo - 310 IMDG: UN1866; Resin Solution; 3; III; FP=31°C; EmS No.: F-E, S-E	
Additional information	US regulations require the reporting of spills when the amount exceeds the Reportable Quantity (RQ) for specific components of this material. See CERCLA in Section 15, Regulatory Information, for the Reportable Quantities.	

Section 15. Regulatory information

Other regulations

This section does not reference all applicable regulatory compliance lists.

TSCA: All ingredients are listed or compliant with TSCA.

DSL: All ingredients are listed or compliant with the NSNR.

Proposition 65 Warning: This product contains a chemical(s) known to the State of California to cause cancer, birth defects and/or reproductive harm.

SARA 302 component(s): None.

SARA 313 component(s): Styrene.

CERCLA(RQ): Styrene - 1000 lbs. (453.6 kg)

Section 16. Other information

Prepared by	AOC, LLC - Corporate Regulatory Affairs.	FL; IN

LEGAL DISCLAIMER

Pipevision, Inc

CIPP-DESIGN (US Units)
CIPP Liner Thickness for Non-Pressure Pipes
By ASTM F1216-07b Appendix X1 Design Method

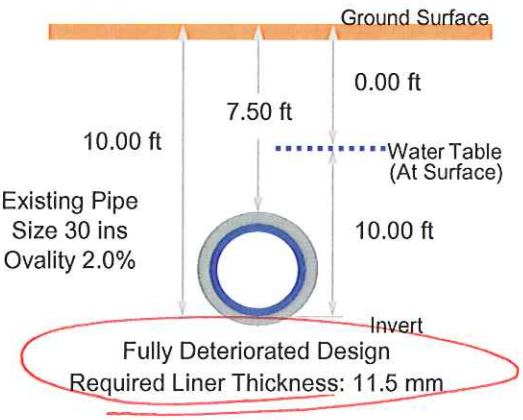
PROJECT INFORMATION

Arold Construction Company Inc.
51 Powder Mill Bridge Rd.
Kingston, NY 12401

16-028R
Walck Rd Sewer Lining North Tonawanda, NY

SUBMITTAL APPROVED BY:
AROLD CONSTRUCTION

30" Liner Design up to 10.0' Deep



EXISTING PIPE PARAMETERS	ENTERED
Design Condition	Fully Det.
Inside Diameter of Existing Pipe	30 ins
Depth to Invert	10 ft
Water Table Below Surface	0 ft
Ovality	2%
Soil Density	120 lb/ft3
Soil Modulus	1,000 psi
Live Load	HS-20
Other Load	0 psi
Vacuum Condition	0 psi
CIPP LINER PARAMETERS	ENTERED
Flexural Modulus short-term	400,000 psi
Flexural Strength short-term	4,500 psi
Long-term Retention	50%
Safety Factor	2
Enhancement Factor	7
Poisson's Ratio	0.3

FACTOR SUMMARY - FULLY DETERIORATED		
Flexural Modulus long-term	200,000 psi	
Flexural Strength long-term	2,250 psi	
Minimum Dia for host pipe	29.40 ins	
Maximum Dia for host pipe	30.60 ins	
Ovality Reduction Factor	0.836	
Water Buoyancy Factor	0.670	Lower Limit
Coeff of Elastic Support	0.289	
Soil Pressure, Overt	4.19 psi	7.50 ft Cover
Water Pressure, Overt	3.25 psi	7.50 ft Head
Live Load Pressure	1.12 psi	
Other Load Pressure	0.00 psi	
Vacuum Pressure	0.00 psi	
Total Design Pressure	**8.56 psi**	
Inside Diameter After Lining	29.10 ins	

FULLY DETERIORATED DESIGN REQUIRES SATISFYING F1216-X1 EQUATIONS X1.1, X1.2, X1.3 & X1.4

F1216 X1 Equations solved for liner thickness t	t mm	t ins	DR
Hydraulic loads due to groundwater X1.1: $P = [2KE_L/(1-v^2)] \times [1/(DR-1)^3] \times [C/N]$	11.3 mm	0.444 ins	67.57
Minimum thickness for ovality X1.2: $(1.5q/100)(1+q/100)DR^2-0.5(1+q/100)DR=s/(PN)$	7.6 mm	0.298 ins	100.67
Hydraulic, soil & live loads - Fully Deteriorated Governs X1.3: $q_t=[1/N] \times [32R_wB'E'_sC(E_LI/D^3)]^{1/2}$	11.5 mm	0.451 ins	66.52
Minimum thickness - Fully Deteriorated X1.4: $EI/D^3 = E/[12(DR^3)]$ greater or equal 0.093	10.7 mm	0.423 ins	70.92
Required Liner Thickness - Fully Deteriorated	**11.5 mm**	**0.451 ins**	**66.52**

t ins is rounded-up to 3 decimal places; t mm = t ins x 25.4; DR = (Inside Diameter ins)/(t ins).

COMMENTS

USE 12.0 MM LINER

Approved By:
M. Gardiner

Pipevision, Inc

CIPP-DESIGN (US Units)
CIPP Liner Thickness for Non-Pressure Pipes
By ASTM F1216-07b Appendix X1 Design Method

PROJECT INFORMATION

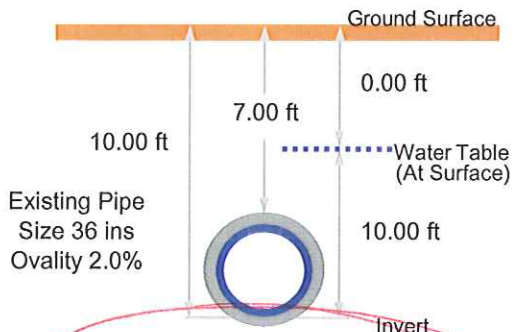
Arold Construction Company Inc.
51 Powder Mill Bridge Rd.
Kingston, NY 12401

16-028R
Walck Rd Sewer Lining North Tonawanda, NY

36" Liner Design up to 10.0' Deep

SUBMITTAL APPROVED BY:

AROLD CONSTRUCTION



Fully Deteriorated Design
Required Liner Thickness: 13.5 mm

EXISTING PIPE PARAMETERS	ENTERED
Design Condition	Fully Det.
Inside Diameter of Existing Pipe	36 ins
Depth to Invert	10 ft
Water Table Below Surface	0 ft
Ovality	2%
Soil Density	120 lb/ft3
Soil Modulus	1,000 psi
Live Load	HS-20
Other Load	0 psi
Vacuum Condition	0 psi
CIPP LINER PARAMETERS	ENTERED
Flexural Modulus short-term	400,000 psi
Flexural Strength short-term	4,500 psi
Long-term Retention	50%
Safety Factor	2
Enhancement Factor	7
Poisson's Ratio	0.3

FACTOR SUMMARY - FULLY DETERIORATED		
Flexural Modulus long-term	200,000 psi	
Flexural Strength long-term	2,250 psi	
Minimum Dia for host pipe	35.28 ins	
Maximum Dia for host pipe	36.72 ins	
Ovality Reduction Factor	0.836	
Water Buoyancy Factor	0.670	Lower Limit
Coeff of Elastic Support	0.283	
Soil Pressure, Overt	3.91 psi	7.00 ft Cover
Water Pressure, Overt	3.03 psi	7.00 ft Head
Live Load Pressure	1.22 psi	
Other Load Pressure	0.00 psi	
Vacuum Pressure	0.00 psi	
Total Design Pressure	**8.16 psi**	
Inside Diameter After Lining	34.94 ins	

FULLY DETERIORATED DESIGN REQUIRES SATISFYING F1216-X1 EQUATIONS X1.1, X1.2, X1.3 & X1.4

F1216 X1 Equations solved for liner thickness t	t mm	t ins	DR
Hydraulic loads due to groundwater Governs X1.1: $P = [2KE_L/(1-v^2)] \times [1/(DR-1)^3] \times [C/N]$	13.5 mm	0.532 ins	67.67
Minimum thickness for ovality X1.2: $(1.5q/100)(1+q/100)DR^2-0.5(1+q/100)DR=s/(PN)$	9.1 mm	0.358 ins	100.56
Hydraulic, soil & live loads - Fully Deteriorated X1.3: $q_t=[1/N] \times [32R_wB'E'_sC(E_LI/D^3)]^{1/2}$	13.4 mm	0.528 ins	68.18
Minimum thickness - Fully Deteriorated X1.4: $EI/D^3 = E/[12(DR^3)]$ greater or equal 0.093	12.9 mm	0.507 ins	71.01
Required Liner Thickness - Fully Deteriorated	**13.5 mm**	**0.532 ins**	**67.67**

t ins is rounded-up to 3 decimal places; t mm = t ins x 25.4; DR = (Inside Diameter ins)/(t ins).

COMMENTS

USE 13.5 MM LINER

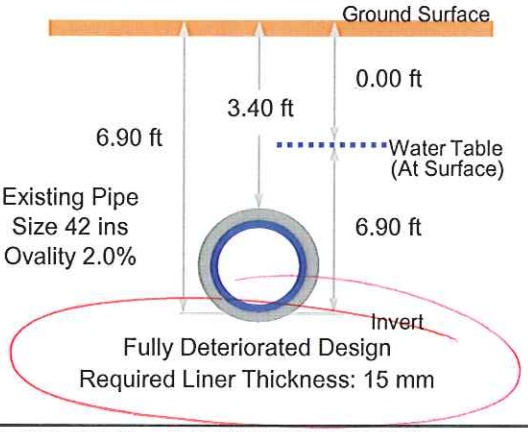
Approved By:
M. Gardiner

PROJECT INFORMATION

Arold Construction Company Inc.
51 Powder Mill Bridge Rd.
Kingston, NY 12401

16-028R
Walck Rd Sewer Lining North Tonawanda, NY
SUBMITTAL APPROVED BY:
42" Liner Design up to 6.9' Deep

AROLD CONSTRUCTION



EXISTING PIPE PARAMETERS	ENTERED
Design Condition	Fully Det.
Inside Diameter of Existing Pipe	42 ins
Depth to Invert	6.9 ft
Water Table Below Surface	0 ft
Ovality	2%
Soil Density	120 lb/ft3
Soil Modulus	1,000 psi
Live Load	HS-20
Other Load	0 psi
Vacuum Condition	0 psi
CIPP LINER PARAMETERS	ENTERED
Flexural Modulus short-term	400,000 psi
Flexural Strength short-term	4,500 psi
Long-term Retention	50%
Safety Factor	2
Enhancement Factor	7
Poisson's Ratio	0.3

FACTOR SUMMARY - FULLY DETERIORATED		
Flexural Modulus long-term	200,000 psi	
Flexural Strength long-term	2,250 psi	
Minimum Dia for host pipe	41.16 ins	
Maximum Dia for host pipe	42.84 ins	
Ovality Reduction Factor	0.836	
Water Buoyancy Factor	0.670	Lower Limit
Coeff of Elastic Support	0.238	
Soil Pressure, Overt	1.90 psi	3.40 ft Cover
Water Pressure, Overt	1.47 psi	3.40 ft Head
Live Load Pressure	2.64 psi	
Other Load Pressure	0.00 psi	
Vacuum Pressure	0.00 psi	
Total Design Pressure	**6.01 psi**	
Inside Diameter After Lining	40.82 ins	

FULLY DETERIORATED DESIGN REQUIRES SATISFYING F1216-X1 EQUATIONS X1.1, X1.2, X1.3 & X1.4

F1216 X1 Equations solved for liner thickness t	t mm	t ins	DR
Hydraulic loads due to groundwater X1.1: $P = [2KE_L/(1-v^2)] \times [1/(DR-1)^3] \times [C/N]$	14.0 mm	0.550 ins	76.36
Minimum thickness for ovality X1.2: $(1.5q/100)(1+q/100)DR^2-0.5(1+q/100)DR=s/(PN)$	8.9 mm	0.352 ins	119.32
Hydraulic, soil & live loads - Fully Deteriorated X1.3: $q_t=[1/N] \times [32R_wB'E'_sC(E_LI/D^3)]^{1/2}$	13.5 mm	0.533 ins	78.80
Minimum thickness - Fully Deteriorated Governs X1.4: $EI/D^3 = E/[12(DR^3)]$ greater or equal 0.093	15.0 mm	0.592 ins	70.95
Required Liner Thickness - Fully Deteriorated	**15.0 mm**	**0.592 ins**	**70.95**

t ins is rounded-up to 3 decimal places; t mm = t ins x 25.4; DR = (Inside Diameter ins)/(t ins).

COMMENTS

USE 15.0 MM LINER

Approved By:
M. Gardiner

Appendix C
Submittal for Cured-in-Place Manhole Lining

AROLD
CONSTRUCTION COMPANY, INC.
51 POWDER MILL BRIDGE RD. KINGSTON, NY 12401
(845) 336-8753 PHONE (845) 336-8245 FAX
www.aroldconstruction.com

Submittal
For
Cured In Place Manhole

Installer: Arold Construction Co. Inc
Manufacturer: Terre Hill Composites

Walck Road Sewer Lining
North Tonawanda, New York

7/12/2016 **16-028R**

MULTIPLEXX LINER SYSTEM
MODEL PVCP-F FUSED SEAMS

BY
TERRE HILL COMPOSITES, LLC.
400 West Main Street, Suite 105
Ephrata, PA 17522
E-Mail: info@thcomposites.com
WEB ADDRESS: www.thcomposites.com
TEL.: 717-738-9164, FAX: 717-738-6946
This specification is available on disk.

PART I- GENERAL

1.1 DESCRIPTION OF WORK

A. This work shall include the furnishing of all labor, materials, and equipment for the rehabilitation of an existing manhole with a cured-in-place PVC composite liner.

B. The manhole liner shall be manufactured to the shape of the manhole. The fibrous portion of the liner shall be saturated with a modified epoxy resin, then pressurized and cured in-place.

C. Fused seams will allow the liner to be inflated and pressurized between ½ - 8 pounds per square inch, with or without an inflation bladder.

D. The seams of the liner shall be sealed with fusion welding equipment. The design shall be as described in US Patent 6,540,438 B2.

E. The exposed surface of the liner shall be **white PVC**.

1.2 LINER PERFORMANCE REQUIREMENTS

A. Liner shall be of the type that allows rehabilitation of a concentric, eccentric or flat top manhole without removing the manhole ring and top section or corbel.

B. The liner shall be installed and cured in place via controlled curing by heat and pressurization in the manhole to complete the curing process.

C. The lining of the manhole shall result in a structure to the shape and contour of the existing manhole. The liner shall be installed and substantially bond to the interior manhole substrate and be watertight, free of any joints or

openings other than pipe inlets, outlets and the cover frame opening.

D. Where indicated on the manhole schedule the lining shall be designed with independent structural hoop strength for full height hydrostatic pressure as if the liner were a secondary vessel inside the existing manhole. The manufacturer shall design adequate liner thickness into the system with or without additional fiberglass layers.

E. Where indicated on the manhole schedule the inverts shall be lined.

1.3 QUALITY ASSURANCE

A. Reference Standards: Comply with applicable provisions and recommendations of the following:

1. ASTM D 695-10 Standard Test Method for Compressive Properties of Rigid Plastics.

1.4 SUBMITTALS

A. Copies of the manhole dimensions, installation instructions, and manufacturer's product data sheet to be submitted for the Engineer's review.

B. If required, calculations for the round manhole lining that demonstrate hoop strength under maximum hydrostatic conditions. The calculation shall assume zero liner adhesion to the existing structure, but assume lateral support from the existing wall. The calculated hoop stress shall be less than 11% of the compressive strength as determined by appropriate ASTM test method.

PART 2-PRODUCTS

2.1 MATERIALS

A. Manhole interior walls and benches shall be patched with cementitious patching/plugging compounds as manufactured by Pre-Blend Products, Inc., Inc., or approved equal.

B. Channel reconstruction cement shall be Blendcrete as manufactured by Pre-Blend Products, Inc., formed cement concrete of 4,000-psi compression strength, or approved equal.

C. As a minimum the manhole liner systems shall be composed of a multiple layered composite. The primary layer shall be manufactured from 25 mils PVC with 10 ounce per square yard polyester fleece. The surface hairs of the fleece must be embedded in the molten PVC during the manufacturing

process of the PVCP laminate. Glued laminates are not allowed.

D. The fibrous body will be impregnated with a modified epoxy resin. Add fiberglass and resin, for additional liner thickness.
Multiplexx Liner™ PVCP:

PVCP25-10=86 mils.	(25 mil PVC & 10 oz Fleece). (i.e. no fiberglass)
PVCP25-28=88 mils.	(25 mil PVC, 10 oz Fleece & 18 oz Fiberglass).
PVCP25-34=110 mils.	(25 mil PVC, 10 oz Fleece & 24 oz Fiberglass).
PVCP25 custom mils	(25 mil PVC, 10 oz Fleece & Fiberglass as required).

E. Liner Thickness: The anticipated hydrostatic head "h" in feet above the bottom of the invert and the Radius "R" in feet of the structure shall determine the necessary liner thickness "t" in mils.

2.2 APPLICABLE MANUFACTURERS

A. Products specified by named manufacturers are specified as a standard of quality.

1. Multiplexx™ PVCP Liner System.
2. Approved equal.

2.3 ACCEPTABLE LINER INSTALLERS.

A. Licensees of Terre Hill Composites, Inc. (the manufacturer of the Multiplexx™ PVCP Liner System. U.S. Patent number 5,106,440, 6,540,438 B2 and 6,540,439 B2. Phone: 717-738-9164, Fax: 717-738-6946.

B. Approved equal.

PART 3-EXECUTION

3.1 MAINTAINING WASTEWATER FLOWS

A. The OWNER shall be fully responsible for restricting the normal sewage flow through the manhole where the specified rehabilitation work demands such flow restriction. The CONTRACTOR will plan his work in order to maintain flows and not interrupt sewer service. This may include night work. The cost of any night work required will be included in the contract price of the applicable item. The CONTRACTOR shall not perform work to manholes until plans for bypass pumping or flow restriction have been submitted by the OWNER and accepted by the CONTRACTOR. Additionally, no plugging of existing Utility System Gravity Mains will be made without the approval of the Utilities Department.

B. Unlined flow channel. Install a bridge or flow through tube and cut the liner bottom near the flow line in the channel to expose the flow channel and give access to the pipes. Plug the pipes entering the manhole through the wall and trim the pipe opening to restore flow.

C. Lined flow channel. Plug the pipes entering the manhole and line the flow channel to the edge of the pipe. Trim all pipe openings and restore the flow.

3.2 PRE-INSPECTION

A. In general, the OWNER assumes responsibility for the structural integrity of existing structure. Prior to beginning work, the manhole shall be visually inspected and any areas of apparent structural damage shall be reported to the OWNER for restoration.

3.3 CLEANING

A. All surfaces of the manhole shall be cleaned with a high-pressure water-jet sprayer with an operating pressure of at least 3,500 psi. Pressure wash the manhole to remove all dirt, grease, sand, and surface contaminants on the wall and floor leaving a clean damp surface.

B. Badly deteriorated and pitted pre-cast manholes and brick manholes, with missing bricks and grout, shall be mudded back to form a smooth compatible surface for the liner.

3.4 PLUGGING RECONSTRUCTION

A. The stopping of active hydrostatic infiltration shall be accomplished by using Quick Plug, as manufactured by Parson Environmental Products, Inc., Reading, PA or approved equal.

B. Water infiltration can also be stopped using expansion type grouts such as Avanti or Seal Guard II.

3.5 CHANNEL RECONSTRUCTION

A. Remove all loose grout and rubble of existing channel. Rebuild channel if required by shaping and repairing slope of shelves or benches. Work shall include alignment of inflow and out flow ports in such manner to prevent the deposition of solids at the transition point. All inverts shall follow the grades of the pipe entering the manhole. Changes in direction of the sewer and entering branch or branches shall have a true curve of as large a radius as the size of the manhole will permit. Channels shall be shaped to allow

entrance of maintenance equipment into pipes including buckets, TV camera, etc.

B. Inverts shall only be lined where indicated on the plans “lined inverts”.

3.6 LINER INSTALLATION

A. Installation shall be by an installer that is qualified by the liner manufacturer. The CONTRACTOR shall include the furnishing of all materials, equipment, tools, and labor as required for the rehabilitation of the manholes selected, including the installation of the interior liner.

B. The installation of the approved liner system shall be in strict accordance with the manufacturer’s instructions. This shall include the preparation, installation, inflation, curing, and finishing operations, required for the completion of the manhole rehabilitation process.

C. All safety rules and regulations, applicable laws and insurance requirements shall be observed in storing, handling, use and application of the liner materials, resins and any solvents.

D. Ventilation shall be provided to the workers at all times.

PART 4-WARRANTY, MEASUREMENT AND PAYMENT

A. The MANUFACTURER shall warrant to the OWNER in writing the performance of the liner for a period of ten years.

B. Payment for the rehabilitation of the structure shall be made at the contract vertical foot price and shall include all necessary labor, material and equipment to clean, seal off any water infiltration, prepare the walls, provide and install the PVCP liner completely. The vertical foot measurement is defined as the distance between bottom of invert and top of cover. Payment value is the product of vertical foot price and vertical foot measurement.

END OF SECTION

Subject: **Limited Warranty** [1]
Reference:

File number:

To Whom It Concerns:

Terre Hill Composites, LLC. provides a ten-year performance Limited Warranty [2] that the MultiPlexx™ Liner PVCP:

a. Will stop deterioration of the lined surfaces [3] by sewer gas induced corrosion;

b. Will prevent infiltration [4] of ground water into the collection system through the lined surfaces;

This Limited Warranty will commence upon completion of the installation of the MultiPlexx™ Liner PVCP.

Respectfully submitted,
Terre Hill Composites, LLC.

Robert W. Fisher
Vice President

---

[1] THIS WARRANTY IS LIMITED BY AND UNDER SUBJECT TO THE TERMS AND CONDITIONS ON THE REVERSE HEREOF, WHICH ARE INCORPORATED HEREIN BY REFERENCE.

[2] The licensed installer shall separately provide a general “One Year” warranty and shall pass through any extended warranty provided by the manufacturer. Terre Hill Composites provides this limited manufacturer’s warranty in conjunction with the Licensed installer. This Limited Warranty is not available as a bonded warranty underwritten by a surety company.

[3] The definition of the “lined surfaces” is the area within the boundaries of the liner edges. All cut edges will be coated with mastic. We exclude secondary intentions such as satisfactory appearance, voids behind the liner, folds and other claims that do not directly affect the ten-year performance warranty.

[4] Neither Terre Hill Composites nor its installer certify the structural integrity of the host structure or claim that the lining system enhances the structural integrity of the host structure sufficiently to comply with ASTM C478 design and other applicable specifications. Additionally any breach arising out of movement of the host structure is expressly excluded.

A. THIS LIMITED WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ANY AND ALL OTHER WARRANTIES, WHETHER THEY ARE WRITTEN, ORAL, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE, AND WHETHER CREATED STATUTORILY, OR OTHERWISE. THERE ARE NO OTHER WARRANTIES, LIMITED, EXPRESS, OR IMPLIED, WHICH EXTEND BEYOND THOSE CONTAINED HEREIN.

B. This warranty is valid under normal use of the manhole. Material changes, such as holes or cuts, void the warranty unless authorized in writing by the Manufacturer.

C. When the liner is required to retain ground water pressure, consult with Manufacturer to assume proper liner thickness.

D. This Limited Warranty does not cover damage to the liner resulting from: misuse or abuse of the liner or reckless negligent acts of any person; acts of God (including, but not limited to, earthquake and flood); damage caused by the host structure or other materials or components installed in the host structure.

E. l. All claims for breach of this Limited Warranty contained herein shall be made in writing to the Manufacturer within ten (10) days of the time the breach is discovered or should have been discovered after reasonable diligence.

2. THE MANUFACTURER WILL NOT HONOR ANY WARRANTY CLAIM MADE PRIOR TO PAYMENT IN FULL BY THE PURCHASER OR GENERAL CONTRACTOR FOR THE WARRANTED PRODUCT.

3. Warranty service must be performed by the Manufacturer or the Manufacturer's authorized agent. Upon validation by the Manufacturer of any claim for breach of the Limited Warranty contained herein, the Manufacturer will, as its sole and exclusive option perform one of the following:

a. repair the failed or defective liner;
b. deliver a replacement liner to the point of original delivery by the Manufacturer; or
c. refund the original purchase price of the liner as was collected by the Manufacturer.

4. The provisions contained in the previous section constitute purchaser's sole and exclusive remedy under any claim or theory of liability, including any claim based upon failure of, or defect in, the liner, whether such claim, however instituted, is based upon contract, indemnity, warranty, tort (including negligence), strict liability or otherwise.

a. The Manufacturer shall not be liable for direct, indirect, consequential or incidental claims, damages or costs of any nature including, without limitation, labor costs of any kind relating to the removal of a failed or defective liner and/or installation of replacement liner or damages, claims or costs otherwise arising from, or in connection with, breach of this Limited Warranty.

b. The manufacturer shall not be liable for any pollution or other adverse environmental claims arising out of the failure of the liner or from consequential damages related thereto.

F. 1. This Limited Warranty is extended to the original purchaser of the liner from the Manufacturer only and may not be assigned by such purchaser to a third party without prior, written authorization of the Manufacturer. Assignment of this Limited Warranty without prior, written authorization of the Manufacturer will void the Limited Warranty.

2. In order for the Manufacturer to perform warranty service or repairs, the host structure must be reasonably accessible. The manufacturer will not be responsible for costs or damages to the liner or to purchaser's property as a result of liner inaccessibility for warranty repair or service.

G 1. The adjudication of any dispute arising under this Limited Warranty must be commenced no later than one (1) year from the date the breach is discovered or should have been discovered. Any adjudication shall be governed by the law of the Commonwealth of Pennsylvania and venue shall be exclusively in the Court of Common Pleas, Lancaster County, Pennsylvania or the US District Court, Eastern District of Pennsylvania.

H. This Limited Warranty contains the complete understanding of the Manufacturer and purchaser and may be modified only in writing signed by the President of Terre Hill Composites.

TERRE HILL COMPOSITES
No better solution for infrastructure rehab.

400 West Main Street, Suite 105
Ephrata, PA 17522
Tel: 717-738-9164 Fax: 717-738-6946
www.thcomposites.com

Manufacturer's Installation Instructions

for the installation of the PVCP/PVCP-F CIPM Lining System

A. ***"Lining preparations"***; US Patents 6,540,438, and 6,540,439 make the process we use possible. The preparations are as following:

The resins and prefabricated liner are shipped to the job site. All manhole liners are factory marked at the cap-strip with MH ID's. Also attached to the cap-strip is a copy of the original field measuring sheet with any notes of significance.

Only a Terre Hill Composites' certified installer is approved to use the PVCP/PVCP-F CIPM Lining system.

An installation truck is self-contained. All necessary tools, such as hand tools, crane, electric generator, high and low pressure pneumatics, hot water generator, power wash equipment, water tank, and the transfer canister are on the truck. A second pickup truck typically carries miscellaneous materials.

Alternately, especially useful in off-road applications is a modified trailer equipped with water tank, generator, pressure washer, portable blower and miscellaneous power and hand-tools as necessary to successfully complete installation of the PVCP/PVCP-F CIPM lining system.

B. Peripheral Considerations:
   1. Traffic: All local, state, and federal traffic regulations and permitting are to be known and abided by.
   2. By-pass: In some cases, by-pass pumping of wastewater will be necessary. The proper use standards of pumps, hoses and related equipment must be understood and followed by the personnel performing such operations.

C. Safety:
   1. It is expected that all field personnel follow standard OSHA procedures for working in a confined space environment. This includes, but is not limited to, the use of a 4-gas detector[1], fall-safe equipment (harness, tripod, cable, etc.), attendant, fresh air ventilation, etc.
   2. Confined space logs must be kept for every manhole lined and be readily available.

D. Manhole Preparation:
   1. Once the site safety concerns are dealt with, the cover of the manhole is removed, the manhole is re-examined[2], and a plan of action is confirmed for the lining of the manhole.
   2. Manufacturer supplied cure logs are started and must be maintained in real time throughout the lining. Copies of these logs are to be sent to the manufacturer ASAP for every liner installed. The manufacturer's material warranty will not be applied to any liner without a complete and accurate log.

   3. If the manhole is not too dirty, the installer might start preparation immediately by cutting

steps and other protrusions.

4. Steps shall be cut back as close to the substrate as possible and not be left protruding more than 1". Any protruding steps must be flattened or rounded-over so that no sharp edges remain. Non-shrink grout must then be applied in about 4" diameter and profiled to ensure a good mechanical bond with the PVCP liner.
5. If the manhole is fairly dirty, or once initial cut-out is performed, the installation will start with the power-washing of the interior of the manhole at a minimum of 3500 PSI.
6. Steps and other protrusions are removed (if not already done).
7. Pipes and protrusions are filleted to assure a good liner fit and to limit void spaces. All incoming laterals and sewer main line openings shall be properly trimmed and grouted with hydraulic or other acceptable non-shrink grout forming a radius fillet (not less than a 6 inch radius) between the structure wall and each pipe. Such application of grout shall extend at least four inches from the outlet onto the wall area making a smooth transition for the liner connection to the pipe openings, and shall be brushed to achieve a profile to ensure a mechanical bond to the liner.
8. Leaks are stopped and other cracks are patched.
9. Prior to patching severe defects in the manhole, all loose and deteriorated material shall be removed and disposed of by the Installer.
10. Any other filling or shaping of structure to assure best lining is done at discretion of installer.
11. Benches and flow channels may be rebuilt.
12. If the channel & invert are to be lined, the channel should be patched and reshaped as needed to ensure good flow characteristics and pipe accessibility[3].

E. Liner Wet-Out

1. Surfaces around the structures are protected as needed and a temporary lay-down area is created (typically with plywood and plastic).
2. Liner resin A and B are mixed at a 50:50 volume ratio. Electric drill mixers are used until a homogenous, non-streaked blend is apparent. A 2-minute *minimum* mix time is required for a 5-gallon mix.
3. The installer will have a listing of manufacturer's resin quantity estimates for each liner.
4. It is the installer's responsibility to ensure all resin-carrying fibers of the lining system are completely saturated. Though manufacturer estimates are given based on surface area of general shape, it is known that specific structure geometry and ambient site conditions will affect resin usage or need.
5. The liner is readied by pulling all outer layers up and away from the fleece of the innermost PVCP main liner layer. This process is called "unsocking".
6. The mix is applied to the exposed fleece of the PVCP and spread with paint rollers until it has a semi-gloss and textured appearance. The art is to reach saturation, avoid loss of excess resin, and to avoid meager application areas.
7. The outer layers are socked back one at a time and wet-out as needed. No layer shall consist of more than 2-ply of any material (fiberglass and/or felt).
8. All areas intended to bond to the structure must receive resin.
9. When properly wet-out, the excess resin in the fleece saturates up to two-ply fiberglass when it pushes against the structure surface.
10. Liners with greater than two-ply fiberglass will require additional wet-out steps.

F. Liner Attachment to Installation Canister and Setting of Liner

1. The liner's cap-strip will be strapped to the installation canister using truck straps placed and tightened in such a manner as to assure a tight seal and one which will not allow the liner to "blow-off" the canister during the cure cycle. Special indicators help the installer

preserve angular alignment.

2. Liner shall then be lowered into manhole at installer's discretion to ensure the liner's best fit.
3. Adjustable legs shall be clamped to the canister to maintain the level.
4. The canister lid will then be set.
5. Connect the blower hose for initial inflation.
6. All valves on the installation manifold must be open to ensure a slow and consistent inflation of the liner.
7. *It is critical to allow the air between the substrate and the liner to escape up the walls as the liner inflates from the bottom, up. Too quick an inflation will trap air and cause issues with the liner.*
8. The installer will manipulate the air and liner itself to achieve initial setting of the liner.
9. It may be necessary at times for the installer to enter the liner itself, through the installation canister, to adjust the liner for fit.
10. Once satisfied with the initial set, the inflation bladder will be introduced through the canister lid *and inflated slowly so as to minimize air entrapment between it and the liner.*
11. In some cases, the inflation bladder may be factory-inserted into the liner.
12. Pressure will be increased gradually until the friction of the liner with the surface is greater than the upward pull force from the canister. A slight lift at the support legs is acceptable. These legs should be readjusted as needed so that they sit on the ground. This is critical when the cure cycle is complete and pressure is relieved. Otherwise, the weight of the canister will come down upon the newly cured liner.

G. Liner Cure Cycle

1. The boiler will be started to prepare for the introduction of hot water into the bladder cavity. The inspection port in the canister lid is clear until hot water is allowed to enter the bladder. This enables the installer to inspect and if necessary to enter the cavity to manually correct misalignments.
2. The foreman decides when to introduce the hot water spray. The pressure may increase to a maximum of 5 PSI – 3 PSI is more typical.
3. The cure time "Start" is recorded as the time the temperature at the canister reaches 150 degrees Fahrenheit.
4. The cure temperature must reach a minimum of 180 degrees Fahrenheit at the canister gauge. Occasionally the air valve is closed to make up a pressure loss.
5. Typical cure heat is 200 F.
6. Adjust the support legs down to make up the lift of the canister.
7. The curing time depends on the size of the structure, ambient temperature and purpose of lining. The minimum cure time in all cases unless described in writing by the manufacturer is 1 hour[4].
8. When the foreman is satisfied with the resin condition just below the capping strip, he will lower the heat at the boiler to start the COOL DOWN cycle.
9. When the temperature reaches 170 F to 180 F, the boiler is turned off and the canister valves are opened[5].
10. Next, the blower is stopped.
11. When the pressure has dropped to -0-, the lid of the canister can be removed.
12. The legs will support the canister when the pressure is off.
13. Some initial cooling of the inside of the liner (through the inflation bladder) will be achieved with the use of a high volume/low pressure blower fan.
14. A submersible pump will be introduced to remove the condensate from the bladder.
15. The canister and bladder will be cut away from the liner.

H. Cutting and Dressing of the Cured Liner
    1. Cut all excess liner material from the manhole. This means trim slightly below the support lip of the cover. Trim the pipe entry points. Trim at the flow channel / bench edge, or at the inlet and outlet pipes if invert lining.
    2. Cover the trimmed edges with THC silica epoxy mastic.

I. Site Clean-Up
    1. The work site should be cleaned to as-good-as or better-than when-found condition.

---

1. Carbon monoxide (CO), hydrogen sulfide (H2S), oxygen (O2), & combustible gases (LEL).
2. An initial site visit and manhole examination has to be performed before liner is produced.
3. It should be understood that once the channel is lined, it's typically assumed that the installer is responsible for the condition of the channel.
4. The curing rate of the epoxy is accelerated with the energy the hot water releases. The curing is usually stopped when the resin near the canister is non-tacky. Prolonging the cure is entirely up to the installer and benefits the hardness of the resin. A longer cure and cool down period under pressure is needed if hydrostatic back-pressure is expected.
5. It is important to open the air valve to avoid a vacuum inside the liner.

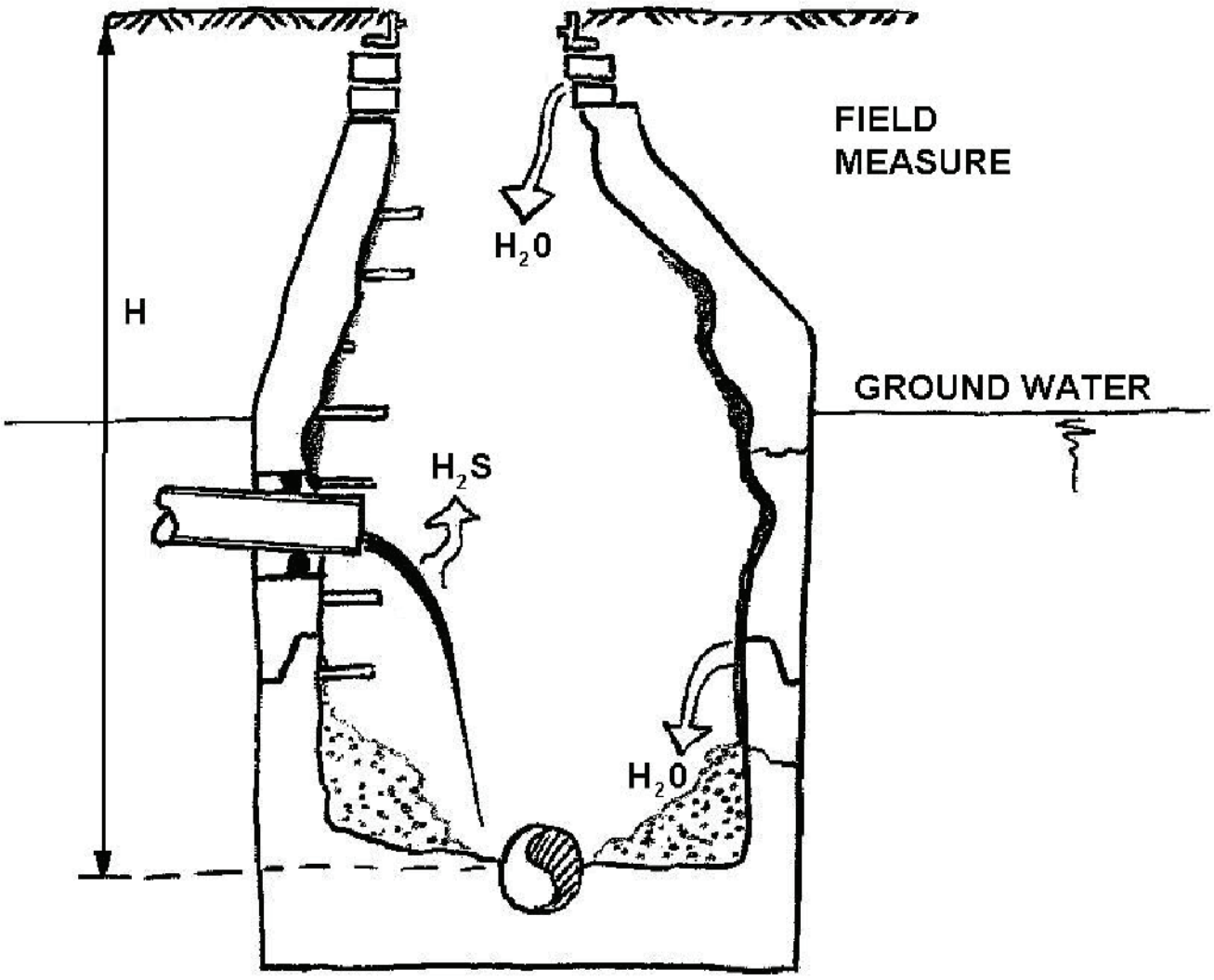
MANHOLE STRUCTURE

IN: HIGH GROUND WATER AREAS

HIGH TURBULENCE (H_2S OFF GASSING)

NEAR FORCE MAINS

SEPTIC CONDITIONS



EXISTING STRUCTURE

DWG ID: SKETCH #1

DATE: 09 JAN. 2007

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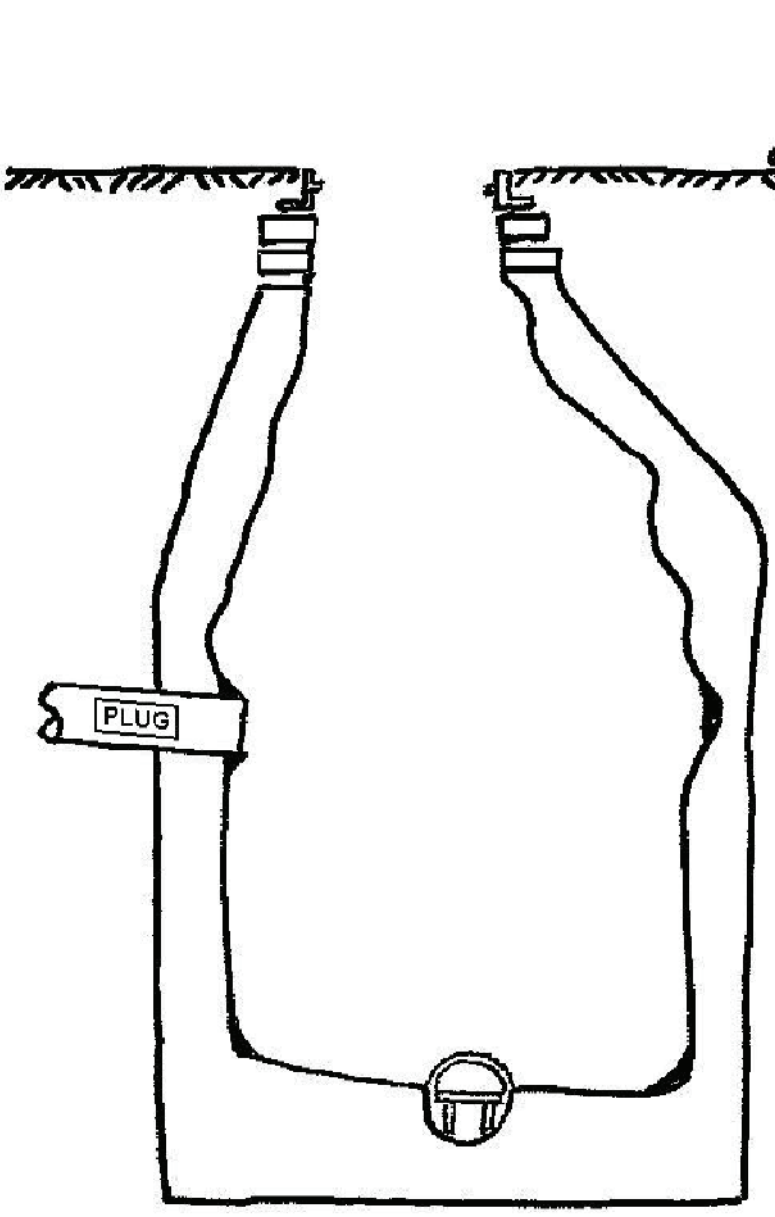
MANHOLE STRUCTURES

INSTALLATION

MULTIPLEXX LINER PVCP



- TRAFFIC CONTROL
- VENTILATE
- POWER WASH.
- CUT STEPS
- CUT LATERALS
- STOP INFILTRATION *
- PATCH SHARP CORNERS
- BUILD FLOW THRU BRIDGE

* RECOMMEND INVERT LINING

STRUCTURE PREPARATION

DWG ID: SKETCH #2

DATE: 09 JAN. 2007

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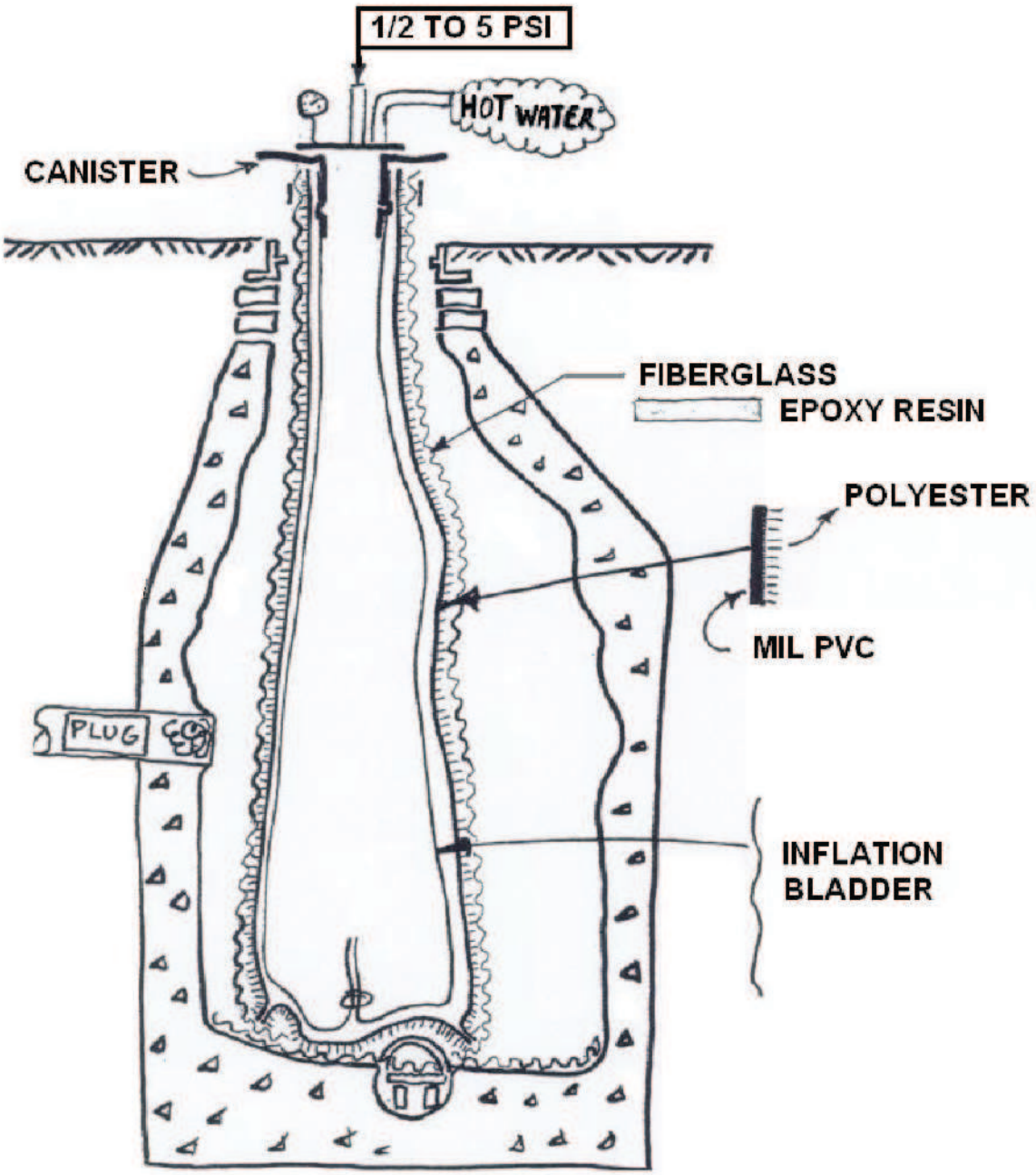
MANHOLE STRUCTURES

INSTALLATION

MULTIPLEXX LINER PVCP



LINER INSTALLATION

DWG ID: SKETCH #3

DATE: 09 JAN. 2007

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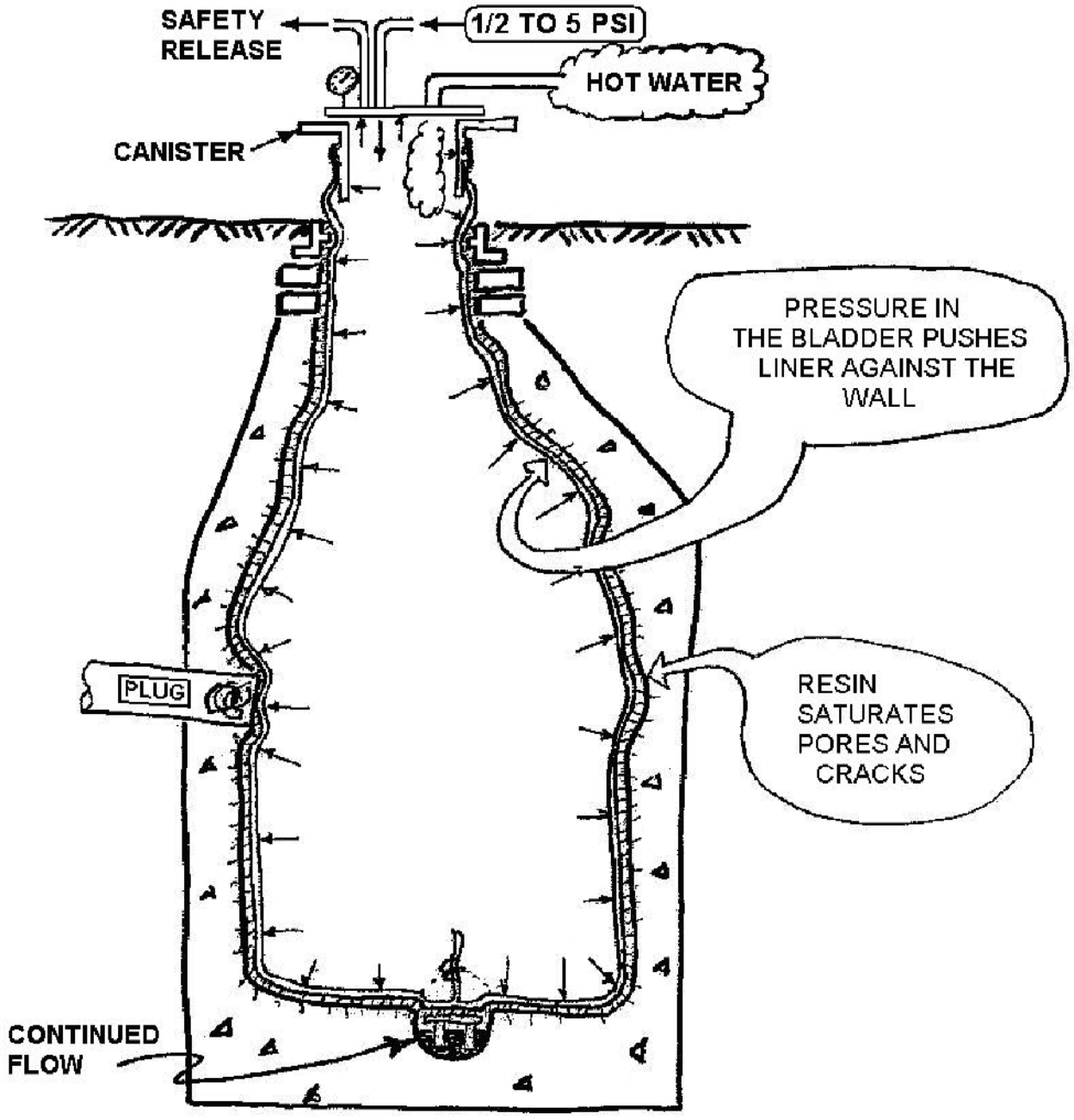
MANHOLE STRUCTURES

INSTALLATION

MULTIPLEXX LINER PVCP



CURING OF LINER

DWG ID: SKETCH #4

DATE: 09 JAN. 2007

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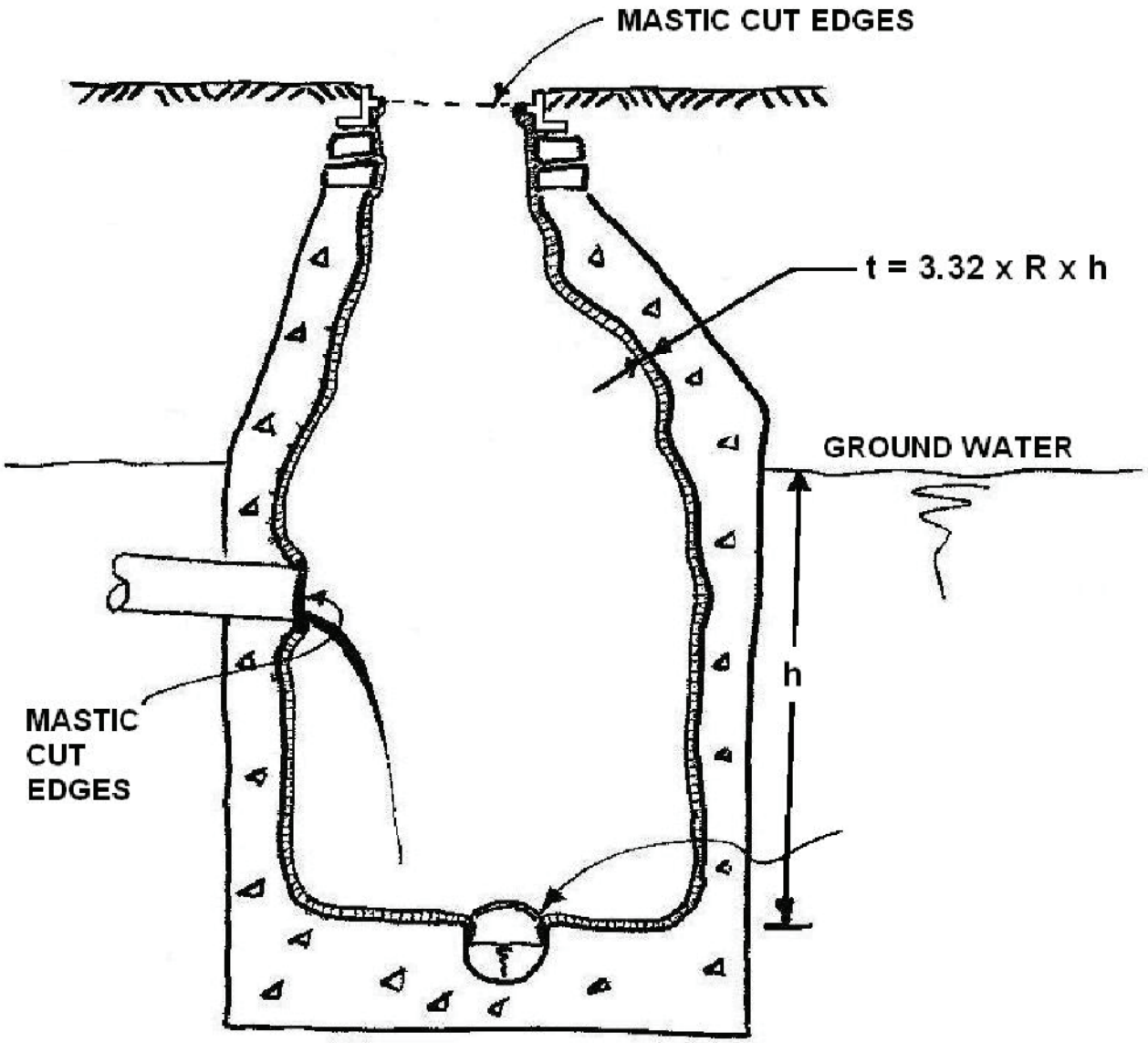
MANHOLE STRUCTURES

INSTALLATION

MULTIPLEXX LINER PVCP



CURED LINER CUTOUT

DWG ID: SKETCH #5

DATE: 09 JAN. 2007

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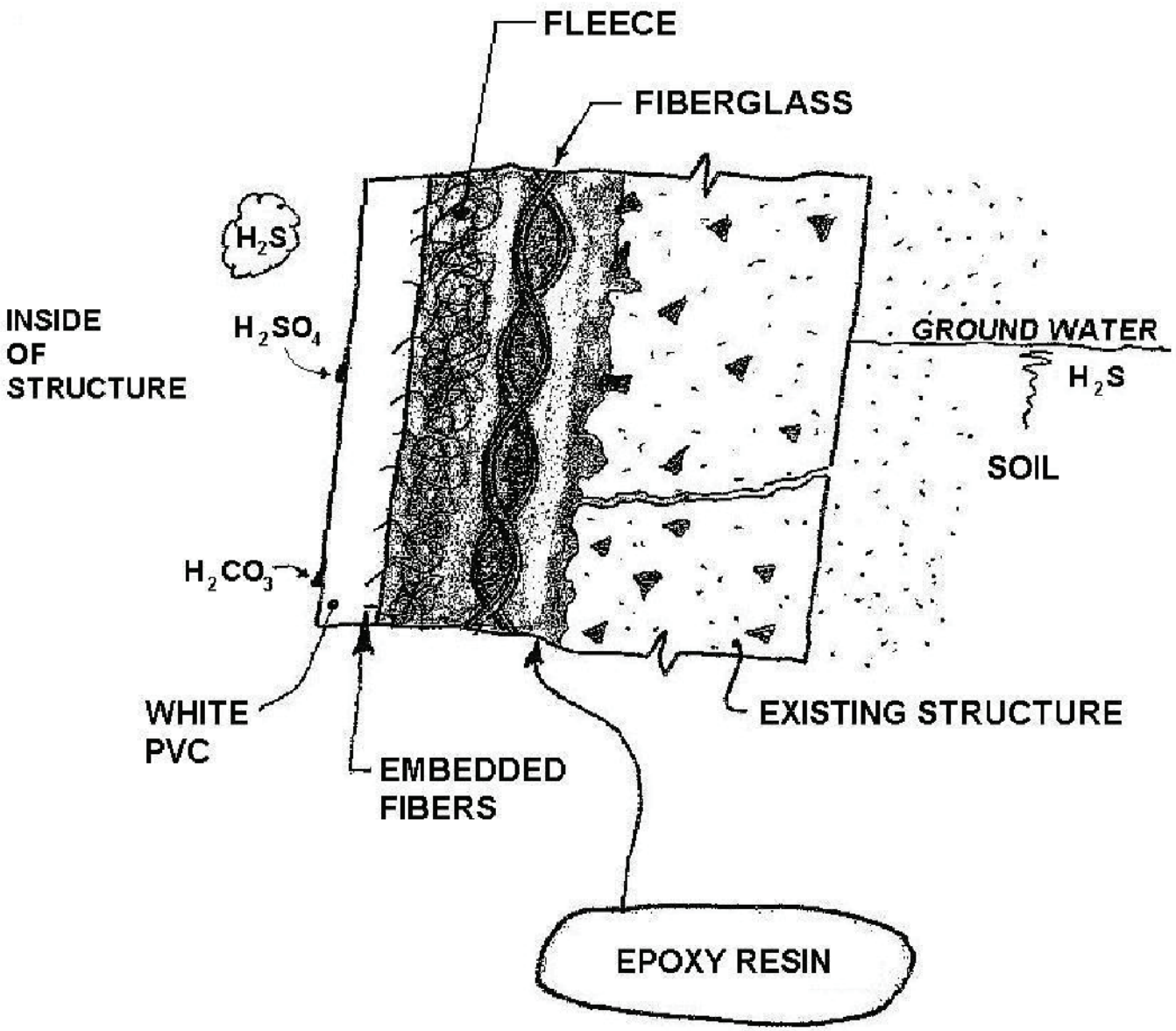
SCHEMATIC COMPONENT CROSS-SECTION

MODEL PVCP20-28 *



* Liner models based on the application of THC's design formula.
Additional layers of fiberglass and/or felt increase liner thickness and strength.

SCHEMATIC CROSS-SECTION

DWG ID: SKETCH #6 | DATE: 09 JAN. 2007

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Concept: In a virtual round structure such as a typical manhole or pump station the following formula is developed to estimate the required liner thickness to resist the design hydrostatic pressure for a given structure radius. The installation technique permits the assumption that the free body diagram of the liner retains its shape under load. In determining the thickness of the liner, we ignore the adhesion of the liner to the substrate. In reality adhesion occurs and is responsible for the watertight seal between the liner and the structure[1].

—

F'_{PU} = ULTIMATE COMPRESSIVE STRENGTH OF COMPOSITE=12,225 PSI[2].

E_P = ELASTICITY MODULUS OF COMPOSITE = 1,000,000 PSI.

$F'_C = 0.4 \times f'_C$ = 1000 PSI. (Match safety factor of concrete)[3]

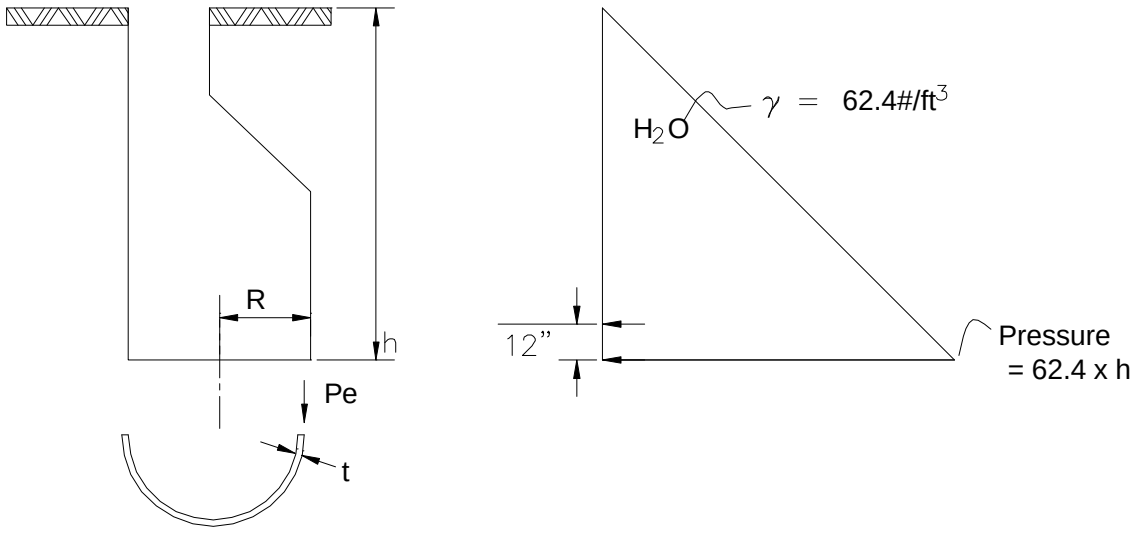
$E'_C = 57{,}000\sqrt{f'_C}$ = 3,122,018 PSI.

t = LINER THICKNESS IN MILS.

h = HYDROSTATIC HEAD IN FEET.

R = RADIUS OF THE STRUCTURE IN FEET.

γ = WATER DENSITY = 62.4 # / CUBICFOOT.



Allowable stress in the composite is:

$$F'_{pu} \therefore \frac{0.4 \times F'_{pu} \times E_p}{E'_C} = \frac{R \times \gamma \times h \times 1{,}000}{t \times 12} \quad \text{this means:} \quad t = \frac{13{,}000 \times E'_C \times R \times h}{F'_{pu} \times E_p}$$

For above material value the thickness of the liner in mils is: **t = 3.32 x R x h**

[1] Comments from Hans de Bruijn, Sales Engineer.
[2] ASTM D-695
[3] 1200 PSI but we assume 1000 PSI.

Revised 08.2007
cc THC File

patent002 w_illus

Material Safety Data Sheet

MSDS NO. 1B

9/27/2010 Rev 01

Emergency HOTLINE: 1-717-445-3100

1. PRODUCT AND COMPANY IDENTIFICATION

MANUFACTURER'S NAME: Terre Hill Composites, Inc.

ADDRESS: 400 West Main St., Suite 105, Ephrata, PA 17522

TELEPHONE NO. (717)-738-9164 (Monday – Friday, 8:00 a.m. – 4:00 p.m., EDT)

PRODUCT NAME &/OR NUMBER: MultiPlexx™ Liner Resin, Part B; Hydropoxxy™ Coating, Part B; Mastic, Part B

TRADE NAME & SYNONYM: Composite liners applicable

CHEMICAL NAME & SYNONYM: Not

CHEMICAL FAMILY: Mixture of polymeric and epoxy resins

FORMULA: Not Applicable

2. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS NO.	%	EXPOSURE LEVEL
Mannich Base	Trade Secret ^	13-75	Not established
Liquid Polyamide Resin	68082-289-1	30-40	Not established
Microfine Silica in the form of Quartz #	14808-60-7	40-50	ACGIH TLV-TWA = 0.05 mg/m^3 (respirable dust) OSHA PEL-TWA = [10 mg/m^3 / (%SiO_2 + 2)] (respirable dust)
Silane, -dimethyldichloro- @	68611-44-9	1-5	Not established

^ Trade secret of component supplier

@ Ingredient found only in Mastic, Part B

Ingredient found only in Hydropoxxy™ Coating and Mastic, Part B

SYNONYMS FOR COMPONENTS:

Liquid Polyamide Resin: Fatty acids, C18-unsaturated, dimers, polymers with tall-oil fatty acids and triethylenetetramine. **Quartz:** Cristobalite; Quartz; Tridymite; Tripoli. **Silane, -dimethyldichloro-:** Silane, dichlorodimethyl-, reaction products with silica.

3. HAZARDS IDENTIFICATION

****

EMERGENCY OVERVIEW

Tan, syrupy semi-solid with an amine odor. Frequent or prolonged contact may irritate the skin and cause a skin rash (dermatitis). During a fire, irritating and highly toxic gases may be generated.

****

4. FIRST AID MEASURES

INGESTION: Call a physician immediately. Do not induce vomiting. Give large amounts of water or milk if available and transport to medical facility. Never give anything by mouth to an unconscious person. **EYES:** Flush eye with large amounts of water for at least 30 minutes. Get medical attention. **SKIN:** Wash affected skin and clothing with soap and water. Get medical attention if irritation develops or persists. **INHALATION:** Remove to fresh air. Get

medical attention immediately. If breathing is difficult, give oxygen. **NOTES TO PHYSICIAN:** Corrosive. May cause stricture. If lavage is performed, suggest endotracheal and/or esophagoscopic control. If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Supportive care: Treatment based on physician's judgment in response to patient's reactions.

5. FIRE FIGHTING MEASURES

FLASH POINT: > 392 F / > 200 C based on majority component. **METHOD:** PMCC. **FLAMMABLE LIMITS:** Not determined. **AUTOIGNITION TEMPERATURE:** Not applicable. **EXTINGUISHING MEDIA:** Use water spray or fog, dry chemical, foam, carbon dioxide for extinguishing media**. FIRE & EXPLOSION HAZARDS:** None expected. **FIRE-FIGHTING EQUIPMENT:** Wear self-contained breathing apparatus (SCBA) and protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Wear suitable protective equipment. Normal housekeeping or clean up should suffice. Absorb onto inert material and transfer to an approved container. Keep from entering sewers, lakes or streams. Remove contaminated clothing promptly. Keep contaminated clothing in closed containers. Discard or launder before rewearing. Inform laundry personnel of contaminant's hazards. Industrial waste incineration is the recommended method of disposal, to be performed in accordance with Federal, State and local regulations. **Refer to Section 8 for additional information.**

7. HANDLING AND STORAGE

STORAGE: Store in a cool, well-ventilated area, out of direct sunlight and away from heat and ignition sources. Keep quantity stored as small as possible. Store away from incompatible materials, such as epoxy resins. Strong reactions are possible with epoxy resins at elevated temperatures. Keep containers tightly closed when not in use, and when empty. **SPECIAL PRECAUTIONS:** Ground all transfer equipment. Do not allow product to contact copper or copper-bearing alloys. Follow good housekeeping procedures.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

VENTILATION: Use with ventilation adequate to reduce levels of air contaminants below that which may cause personal injury or illness. Local exhaust ventilation is preferred. General, mechanical or dilution ventilation may be suitable. **RESPIRATORY PROTECTION**: Should not be needed in normal use. **SKIN PROTECTION:** Wear body-protecting clothing to prevent contact . Material is difficult to remove from clothing. **EYE/FACE PROTECTION:** Safety glasses or goggles are always recommended. **GENERAL:** Eye wash and safety shower should be available. Avoid contact with eyes and skin. Wash thoroughly after handling and before eating or drinking. **Refer to Section 2 for exposure guidelines.**

9. PHYSICAL AND CHEMICAL PROPERTIES [+]

BOILING POINT (F/C): > 200 C

PHYSICAL STATE: Semi-solid

pH: Not applicable

FREEZING POINT (F/C): Not applicable

SPECIFIC GRAVITY (H_2O=1): 0.94

VAPOR PRESSURE (mm Hg): < 1 mm Hg @ 20 C / 68 F

% VOLATILE BY VOLUME: Negligible.

VAPOR DENSITY (Air=1): Not available

EVAPORATION RATE (BA=1): Negligible

SOLUBILITY IN WATER: Soluble

APPEARANCE AND ODOR: Tan, syrupy with amine odor

ODOR THRESHOLD: Not established

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable

[+] Based on majority component

10. STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions of use. **CONDITION TO AVOID:** Can react strongly with epoxy resins at elevated temperatures. **INCOMPATIBILITIES:** Epoxy resins under uncontrolled conditions. Powerful oxidizers like fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride, hydrogen peroxide, etc.; acetylene; ammonia. **HAZARDOUS DECOMPOSITION PRODUCTS:** Incomplete combustion or pyrolysis may produce carbon monoxide, nitrogen oxides, hydrogen cyanide, other cyano compounds, and organic compounds of unknown structure. **HAZARDOUS POLYMERIZATION:** Will not occur.

11. TOXICOLOGICAL INFORMATION

ROUTES OF EXPOSURE: May be inhaled, absorbed through the skin, ingested, or may contact the eyes. **EYE:** May cause severe irritation with corneal injury, which may result in permanent impairment of vision, even blindness. Vapors may irritate eyes. **SKIN CONTACT:** May cause severe injury to skin following prolonged or repeated contact, and may cause skin sensitization or other allergic reactions. **SKIN ABSORPTION:** A single prolonged exposure may result in material being absorbed in harmful amounts. **INHALATION:** May cause respiratory sensitization or asthma in susceptible individuals. Excessive exposure may cause slight irritation to upper respiratory tract. Respirable crystalline silica may cause serious lung problems and there is limited evidence silica is a carcinogen. Prolonged skin exposure unlikely to cause irritation. **INGESTION:** Single dose oral toxicity is low. Ingestion may cause gastrointestinal irritation or ulceration, and burns of mouth or throat. **SYSTEMIC & OTHER EFFECTS:** Results of in vitro mutagenicity tests have been negative.

TOXICITY: Mannich Base: The LD_{50} for skin absorption is > 1000 mg/Kg. **Polyamide Resin:** The LD_{50} for skin absorption in rabbits is 800 mg/Kg. The oral LD_{50} for rats is 4340 mg/Kg.

CARCINOGENICITY (applicable only to Quartz ingredient): NTP - Yes; IARC - Yes; ACGIH - Yes; OSHA - No.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: May aggravate pre-existing dermatitis.

TOXICOLOGICALLY SYNERGISTIC PRODUCTS: None known.

12. ECOLOGICAL INFORMATION

No ecotoxicological information found. No chemical fate information found.

13. DISPOSAL CONSIDERATIONS

RCRA Hazard Class: None. If this product as supplied becomes a waste, it does not meet the criteria of a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Wear suitable protective equipment. Use inert material to absorb spill and place in containers for disposal. Keep product out of watercourses by impoundment. Industrial waste incineration is the recommended method of disposal. This advice applies to the material as manufactured. Processing, use, or contamination may make the information inappropriate, inaccurate, or incomplete. The waste generator has the responsibility for proper waste classification, transportation, and disposal. Dispose of material in accordance with Federal, State and local regulations.

DANGER! Empty containers may retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to clean since residue may be difficult to remove. All containers should be disposed of in an environmentally safe manner and in accordance with government regulations. Consult an expert on the disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations.

14. TRANSPORT INFORMATION [based on majority component]

U.S. Department of Transportation: Corrosive Liquid, N.O.S., Class 8, UN 1760, PG III (Contains Tallow Amine).

International Air Transport Association: Classification not determined.

Transport Canada Product Identification Number: Classification not determined.

15. REGULATORY INFORMATION

TSCA (Toxic Substances Control Act): All components of this material appear on the Inventory of Chemical Substances published by the US Environmental Protection Agency (EPA) under the authority of the Toxic Substance Control Act (TSCA).

SARA Title III (Superfund Amendments & Reauthorization Act): 311/312 Hazard Categories: Acute – Yes. Chronic – Yes. Fire – No. Reactive – No. Pressure – No. **313 Reportable Ingredients:** As of the preparation date of this MSDS, this product did not contain substances subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40 CFR 372. This information must be included in all MSDSs that are copied and distributed for this material.

CERCLA (Comprehensive Response Compensation and Liability Act): Not Reportable. Contact local authorities to determine if there may be other local reporting requirements.

WHMIS (Workplace Hazardous Materials Identification System): Not classified. This MSDS has been prepared to meet WHMIS requirements except for use of the 16 headings.

EINECS: All components of this product are on the European Inventory of Existing Commercial Chemical Substances.

NEHAPS (National Environmental Health Action Plans): Contains no regulated substances.

EU CLASSIFICATION AND LABELING INFORMATION: Not applicable. **EU RISK & SAFETY PHRASES:** None.

STATE RIGHT-TO-KNOW REQUIREMENTS: None.

HMIS HAZARD CLASSIFICATION: Health: 2 Fire: 1 Reactivity: 0 Special: User must determine need for special protection.

NFPA CLASSIFICATION: Health: 2 Fire: 1 Reactivity: 0 Special: User must determine need for special protection.

16. OTHER INFORMATION

REVISION SUMMARY for MSDS No. 1B

Date Prepared: December 21, 2000 **Last Revised:** September 27, 2010 **Previous Revision:** Not applicable

Summary of Revisions: 12/21/00 - New MSDS in ANSI Z400.1 format; 9/27/2010 - Updated company information.

This information relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process. The information is derived from the best available sources and is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of this product are not within the control of Terre Hill Concrete Products, it is the user's responsibility to determine the suitability and completeness of this information, and the conditions of safe use of the product, for his own particular use.

Material Safety Data Sheet

MSDS NO. 1A

9/27/2010 Rev 01

Emergency HOTLINE: 1-717-445-3100

1. PRODUCT AND COMPANY IDENTIFICATION

MANUFACTURER'S NAME: Terre Hill Composites, Inc.

ADDRESS: 400 West Main St., Suite 105, Ephrata, PA 17522

TELEPHONE NO. (717)-738-9164 (Monday – Friday, 8:00 a.m. – 4:00 p.m., EDT)

PRODUCT NAME &/OR NUMBER: MultiPlexx™ Liner Resin, Part A; Hydropoxxy™ Coating, Part A; Mastic, Part A

TRADE NAME & SYNONYM: Composite liners applicable

CHEMICAL NAME & SYNONYM: Not

CHEMICAL FAMILY: Mixture of polymeric and epoxy resins

FORMULA: Not Applicable

2. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS NO.	%	EXPOSURE LEVEL
Reaction products of Epichlorohydrin and Bisphenol A	25085-99-8	60-90	Not established
Microfine Silica in the form of Quartz *	14808-60-7	25-50	ACGIH TLV-TWA = 0.05 mg/m^3 (respirable dust) OSHA PEL-TWA = [10 mg/m^3 / (%SiO_2 + 2)] (respirable dust)
Titanium Dioxide	13463-67-7	1-10	ACGIH TLV-TWA = 10 mg/m^3 OSHA PEL-TWA = 15 mg/m^3 (total dust)
Aliphatic Glycidyl Ether ^	68609-97-2	5-10	Not established
Silane, -dimethyldichloro- #	68611-44-9	1-5	Not established

* Ingredient found only in Hydropoxxy™ Coating and Mastic, Part A

^ Ingredient found only in Multiplexx ™ Liner Resin, Part A

Ingredient found only in Mastic, Part A

SYNONYMS FOR COMPONENTS:

Reaction products of Epichlorohydrin and Bisphenol A: Polymer of bisphenol A and epichlorohydrin; Polymer of diglycidyl ether of bisphenol A and bisphenol A; Low molecular weight solid DGEBPA-based epoxy resins. **Titanium Dioxide:** Titanium oxide; Titanium (IV) oxide; Titanium peroxide; Titanium white; Rutile; Tronox. **Aliphatic Glycidyl Ether:** Oxirane, mono[(C12-14-alkyloxy)methyl] derivatives. **Silane, -dimethyldichloro-:** Silane, dichlorodimethyl-, reaction products with silica.

3. HAZARDS IDENTIFICATION

****

EMERGENCY OVERVIEW

White, syrupy semi-solid with a faint epoxy odor. Irritating to eyes and skin. May cause sensitization by skin contact. Toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment. During a fire, irritating and highly toxic gases may be generated.

****

4. FIRST AID MEASURES

INGESTION: Call a physician immediately. ONLY induce vomiting at the instructions of a physician. Never give anything by mouth to an unconscious person. **EYES:** Flush eye with large amounts of water for at least 15 minutes. Get medical attention. **SKIN:** Wash affected skin and clothing with soap and water. Get medical attention if irritation develops or persists. **INHALATION:** Remove to fresh air. Get medical attention immediately. If breathing is difficult, give oxygen. **NOTES TO PHYSICIAN:** No specific antidote. Supportive care. Treatment based on physician's judgment in response to patient's reactions.

5. FIRE FIGHTING MEASURES

FLASH POINT: 485 F / 252 C based on majority component. **METHOD:** PMCC. **FLAMMABLE LIMITS**: Not applicable. **AUTOIGNITION TEMPERATURE:** Not applicable. **EXTINGUISHING MEDIA:** Use water spray or fog, dry chemical, foam, carbon dioxide for extinguishing media**. FIRE & EXPLOSION HAZARDS:** None expected. **FIRE-FIGHTING EQUIPMENT:** Wear self-contained breathing apparatus (SCBA) and protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Wear suitable protective equipment. Normal housekeeping or clean up should suffice. Absorb onto inert material and transfer to an approved container. Keep from entering sewers, lakes or streams. Remove contaminated clothing promptly. Keep contaminated clothing in closed containers. Discard or launder before rewearing. Inform laundry personnel of contaminant's hazards. Industrial waste incineration is the recommended method of disposal, to be performed in accordance with Federal, State and local regulations. **Refer to Section 8 for additional information.**

7. HANDLING AND STORAGE

STORAGE: Store in a cool, well-ventilated area, out of direct sunlight and away from heat and ignition sources. Keep quantity stored as small as possible. Store away from incompatible materials, such as strong oxidizing agents or strong mineral acids. Keep containers tightly closed when not in use, and when empty. **SPECIAL PRECAUTIONS:** Reactions with curing agents may release considerable heat. Smoke or toxic fumes may form if the heat of reaction becomes excessive due to high curing temperatures or the curing of large amounts of material.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

VENTILATION: Use with ventilation adequate to reduce levels of air contaminants below that which may cause personal injury or illness. Local exhaust ventilation is preferred. General, mechanical or dilution ventilation may be suitable. **RESPIRATORY PROTECTION**: Should not be needed in normal use. **SKIN PROTECTION:** If needed, wear gloves made of chemically resistant material, such as polyvinyl alcohol. Wear body-protecting clothing to prevent contact . Material is difficult to remove from clothing. **EYE/FACE PROTECTION:** Safety glasses or goggles are always recommended. **GENERAL:** Eye wash and safety shower should be available. Avoid contact with eyes and skin. Wash thoroughly after handling and before eating or drinking. **Refer to Section 2 for exposure guidelines.**

9. PHYSICAL AND CHEMICAL PROPERTIES [+]

BOILING POINT (F/C): Not applicable

pH: Not applicable

SPECIFIC GRAVITY (H_2O=1): 1.16

% VOLATILE BY VOLUME: Negligible.

EVAPORATION RATE (BA=1): Negligible

APPEARANCE AND ODOR: White, syrupy with faint epoxy odor.

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable

PHYSICAL STATE: Semi-solid

FREEZING POINT (F/C): Not applicable

VAPOR PRESSURE (mm Hg): Negligible

VAPOR DENSITY (Air=1): Not available

SOLUBILITY IN WATER: Negligible

ODOR THRESHOLD: Not established

[+] Based on majority component

10. STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions of use. Material is not heat, pressure, or shock sensitive. **CONDITIONS TO AVOID:** Avoid excessive heating over long periods as degradation may occur. **INCOMPATIBILITIES:** Avoid strong acids and bases. **HAZARDOUS DECOMPOSITION PRODUCTS:** Incomplete combustion or pyrolysis may produce phenolics, and possibly aldehydes, acids and other unidentified toxic organic compounds. **HAZARDOUS POLYMERIZATION:** Masses of more than one pound of product plus aliphatic amine will cause irreversible polymerization with considerable heat build-up.

11. TOXICOLOGICAL INFORMATION

ROUTES OF EXPOSURE: May be inhaled, absorbed through the skin, ingested, or may contact the eyes. Vapors are unlikely due to physical properties, unless heated to high temperatures. Control the level of metals (i.e., Antimony, Selenium, Thorium, Copper, Cobalt, and Vanadium) that may be present at trace levels, to below their individual occupational exposure limits.

INHALATION: Respirable crystalline silica may cause serious lung problems and there is limited evidence silica is a carcinogen. **SKIN CONTACT:** Skin absorption potential is low. Avoid grinding or milling which may generate levels of crystalline silica more than 0.1%. Prolonged skin exposure is unlikely to cause irritation. **INGESTION:** No ingestion hazards anticipated due to industrial exposure. **EYE:** May cause transient eye irritation. Corneal injury is unlikely. **SYSTEMIC & OTHER EFFECTS:** No known effects.

TOXICITY: Reaction products of Epichlorohydrin and Bisphenol A: LC_{50} (rat): greater than 791 mg/m3 (4-hour exposure) (EPON Resin 2002 dust; molecular weight approximately 1300). LD_{50} (oral, rat): 30000 mg/kg (EPON 1001; molecular weight 900). LD_{50} (oral, mouse): 20000 mg/kg (EPON 1001). LD_{50} (dermal, rabbit). Greater than 23500 mg/kg (cited as 20 mL/kg) (an unspecified commercial DGEBPA-based epoxy resin). The following elements may be present in small concentrations as oxides: aluminum, calcium, iron, magnesium, nickel, phosphorus, potassium, silicon, sulfur, titanium, and vanadium. Alumina Silicate: Typically 65 pg/g NATO/CCMS/TCDD Equivalent (pg – a picogram – is one million of a gram (10^{-12})).

CARCINOGENICITY: NTP - No; IARC - No; ACGIH - No; OSHA - No. Epoxy resin representative of current ingredient component is not believed to be a cancer hazard to humans. Results of mutagenicity tests in animals have been negative. Has been shown to be negative in some in vitro mutagenicity tests and positive in others.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: May aggravate pre-existing dermatitis.

TOXICOLOGICALLY SYNERGISTIC PRODUCTS: None known.

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION: Toxic to aquatic organisms. **CHEMICAL FATE INFORMATION:** May cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

RCRA Hazard Class: None. If this product as supplied becomes a waste, it does not meet the criteria of a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Wear suitable protective equipment. Use inert material to absorb spill and place in containers for disposal. Keep product out of watercourses by impoundment. Industrial waste incineration is the recommended method of disposal. This advice applies to the material as manufactured. Processing, use, or contamination may make the information inappropriate, inaccurate, or incomplete. The waste generator has the responsibility for proper waste classification, transportation, and disposal. Dispose of material in accordance with Federal, State and local regulations.

DANGER! Empty containers may retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to clean since residue may be difficult to remove. All containers should be disposed of in an environmentally safe manner and in accordance with government regulations. Consult an expert on the disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations.

14. TRANSPORT INFORMATION [based on majority component]

U.S. Department of Transportation: Not regulated.

International Air Transport Association: Classification not determined.

Transport Canada Product Identification Number: Classification not determined.

15. REGULATORY INFORMATION

TSCA (Toxic Substances Control Act): All components of this material appear on the Inventory of Chemical Substances published by the US Environmental Protection Agency (EPA) under the authority of the Toxic Substance Control Act (TSCA).

SARA Title III (Superfund Amendments & Reauthorization Act): 311/312 Hazard Categories: Acute – No. Chronic – No. Fire – No. Reactive – No. Pressure – No. **313 Reportable Ingredients:** As of the preparation date of this MSDS, this product did not contain substances subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40 CFR 372. This information must be included in all MSDSs that are copied and distributed for this material.

CERCLA (Comprehensive Response Compensation and Liability Act): Not Reportable. Contact local authorities to determine if there may be other local reporting requirements.

WHMIS (Workplace Hazardous Materials Identification System): Not classified. This MSDS has been prepared to meet WHMIS requirements except for use of the 16 headings.

EINECS: All components of this product are on the European Inventory of Existing Commercial Chemical Substances.

NEHAPS (National Environmental Health Action Plans): Contains no regulated substances.

EU CLASSIFICATION AND LABELING INFORMATION [based on majority component**]:** Irritant; Sensitizing; Dangerous for the environment. [Xi;R43;N].

Xi

EU Risk Phrases: Irritating to eyes and skin. May cause sensitization by skin contact. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment [R:36/38-43-51/53]

EU Safety Phrases: After contact with skin, wash immediately with plenty of water. Wear suitable gloves and eye/face protection. Avoid release to the environment. Refer to special instructions/safety data sheet. [S:(2-)(S-)*28-37/39-61]

STATE RIGHT-TO-KNOW REQUIREMENTS:

Chemical Name: Titanium Dioxide, 1-10% CAS Number: 13463-67-7 New Jersey, Minnesota, Pennsylvania

HMIS HAZARD CLASSIFICATION: Health: 1 Fire: 1 Reactivity: 0 **}Special: User must determine**

NFPA HAZARD CLASSIFICATION: Health: 1 Fire: 1 Reactivity: 0 **} need for special protection**

16. OTHER INFORMATION

REVISION SUMMARY for MSDS No. XX

Date Prepared: December 21, 2000 **Last Revised:** September 27, 2010 **Previous Revision:** Not applicable

Summary of Revisions: 12/21/00 - New MSDS in ANSI Z400.1 format; 9/27/2010 - Updated company information.

This information relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process. The information is derived from the best available sources and is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of this product are not within the control of Terre Hill Concrete Products, it is the user's responsibility to determine the suitability and completeness of this information, and the conditions of safe use of the product, for his own particular use.

TERRE HILL COMPOSITES
No better solution for infrastructure rehab.

400 West Main Street, Suite 105
Ephrata, PA 17522
Tel: 717-738-9164 Fax: 717-738-6946
www.thcomposites.com

Installer Certification

RE: Arold Construction Co., Inc.

Terre Hill Composites, LLC. herewith certifies that Arold Construction Co., Inc. of Kingston, NY, as per agreements and training is qualified to install any and all liner models that are a part of our Terre Hill Multiplexx™ PVCP, and PVCP-F Liner Systems. Our liner system is protected under US Patent 6,540,438 B2 and 6,540,439 B2.

Arold Construction Co., Inc. follows Terre Hill Composites installation guidelines and uses our Terre Hill Multiplexx™ PVCP-F Liner Systems.

Arold Construction Co., Inc.'s primary responsible party as relates to affiliation with Terre Hill Composites is Mr. Ryan Arold, Vice President.

Arold Construction Co., Inc.
51 Powder Mill Bridge Rd.
Ph: (845) 336-8753
Fax: (845) 336-8253

Certification Date: 04 August 2015
Recertification Date: 04 August 2016
Valid Through: 04 August 2018

Respectfully submitted,
Terre Hill Composites, LLC.

Bob Fisher, VP of Operations

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10 Sept 2015

TO: **Ryan Arold**
Arold Construction
51 Powder Mill Bridge Road
Kingston, NY 12401

PROJECT:
Fort Indiantown Gap

THC FILE:
15-137 Fort Indiantown Gap

REGARDING:
Work History of Subcontractor

Terre Hill Composites, LLC. has been the manufacturer of cured-in-place manhole liners since 1998.

Here is a partial listing that shows a portion of our installation history for the past three years:

COMPLETION DATE	FILE NO.	PROJECT	DESCRIPTION	PROJECT STATE	OWNER/ENGINEER
03/03/10	80021	SOUTH WILLIAMSPORT	72 CIPM Liners; 55 CHIMNEY CURES	PA	South Williamsport
04/05/10	90086	VILLAGE OF OWEGO	15 CIPM Liners	NY	Village of Owego
05/05/10	90094	SPRINGFIELD TWP (PENNONI ASSOC.)	8 CIPM Liners	PA	Springfield Township
05/21/10	90036	LYON COUNTY UTILITIES	7 CIPM Liners	NV	Lyon County Utilities Dept
07/01/10	10-109	EVESHAM MUA	4 CIPM Liners	NJ	Evesham Municipal Utilities Authority
11/09/10	10-137	LOWER MERION 4719-10-15	19 CIPM Liners	PA	Lower Merion Township
12/20/10	10-159	UPPER SAUCON 07.2010	15 CIPM Liners	PA	Upper Saucon Township
1/4/11	10-190	DCNR-FRENCH CREEK STATE PARK/FRANKS ELECTRIC	3 CIPM Liners	PA	DCNR
1/13/11	10-161	FORKS TOWNSHIP	5 CIPM Liners	PA	Forks Township
3/15/11	10-187	BOROUGH OF LYONS	18 CIPM Liners	PA	Borough of Lyons
9/22/11	11-162	LOWER FREDERICK TOWNSHIP	9 CIPM Liners	PA	Lower Frederick Township
10/6/11	11-177	TOWNSHIP OF MORRIS	3 CIPM Liners	NJ	Township of Morris
10/12/11	11-172	WAVERLY TOWNSHIP	4 CIPM Liners	PA	Waverly Township
11/2/11	11-179	LOWER PROVIDENCE TOWNSHIP	2 CIPM Liners	PA	Lower Providence Township Sewer Authority
11/7/11	10-197	EAST NORRITON TOWNSHIP	2 CIPM Liners	PA	East Norriton Township
11/17/11	11-216	UWCHLAN TOWNSHIP	2 CIPM Liners	PA	Uwchlan Township

cc THC File

11/18/11	11-173	WILLIAMS VALLEY HIGH SCHOOL (MAZZUCA ENTERPRISES)	3 CIPM Liners	PA	Williams Valley High School
12/1/11	11-228	WHITPAIN TOWNSHIP	2 CIPM Liners	PA	Whitpain Township
12/13/11	11-215	UPPER SAUCON TOWNSHIP	16 CIPM Liners	PA	Upper Saucon Township
2/14/12	11-192	FORKS TOWNSHIP	5 CIPM Liners	PA	Forks Township
5/25/12	11-170	WINSLOW TOWNSHIP	2 CIPM Liners	NJ	Winslow Township
6/27/12	11-204	BETHLEHEM TOWNSHIP	1 CIPM Liner	PA	Bethlehem Township
8/22/12	11-241	WEST EARL TOWNSHIP	10 CIPM Liners	PA	West Earl Township
9/5/12	12-145	HUGHESVILLE	5 CIPM Liners	PA	Hughesville-Wolf Authority
10/10/12	12-173	GROTON (GREEN MOUNTAIN PIPELINE SERVICES, INC.	5 CIPM Liners	CT	Town of Groton
3/5/13	12-120	MIDDLEBURG, PA	40 CIPM Liners	PA	Middleburg
3/8/13	12-216	EAST NORRITON TOWNSHIP	2 CIPM Liners	PA	East Norriton Township
3/14/13	11-231.2	WSSC #CI5182A11 (IPR NORTHEAST)	1 CIPM Liner	MD	WSSC
4/5/13	12-217	LOGAN TOWNSHIP MUA	1 CIPM Liner	NJ	Logan Township MUA
3/26/14	12-192	FORT INDIANTOWN GAP	59 CIPM Liners	PA	Fort Indiantown Gap

cc THC File

Appendix D
Inspection Videos

www.ghd.com