

Pipe Lining by the  
Centrifugally Cast Concrete  
Pipe Process (CCCP)

# AP/M Permaform Corporate History

- Action Products Marketing Corporation (AP/M) began rehabilitating manholes in 1985 with its patented PERMAFORM system for the replacement of manholes without digging and without interrupting flows.
- AP/M recognizes that not all manholes needed complete replacement. So, we developed a cast in place sealing and reinforcing system using the high strength, centrifugally cast PERMACAST specialty mortars.
- This same system was adapted for use in storm and sanitary sewer pipe from 36 inches to 120 inches in diameter.

# Corroded Storm Pipe, Is There any Other Kind?



## Permacast CCCP

How Long Before this Pipe Collapses?



# Filling the Void Below the Pipe is Essential to Our Process



# Spin Cast Spray Head Mechanism



# Structurally Rehabilitated Storm Culvert



# Centrifugally Cast Concrete Pipe

**Corrugated Pipe, Before**



**Corrugated Pipe, After CCCP**

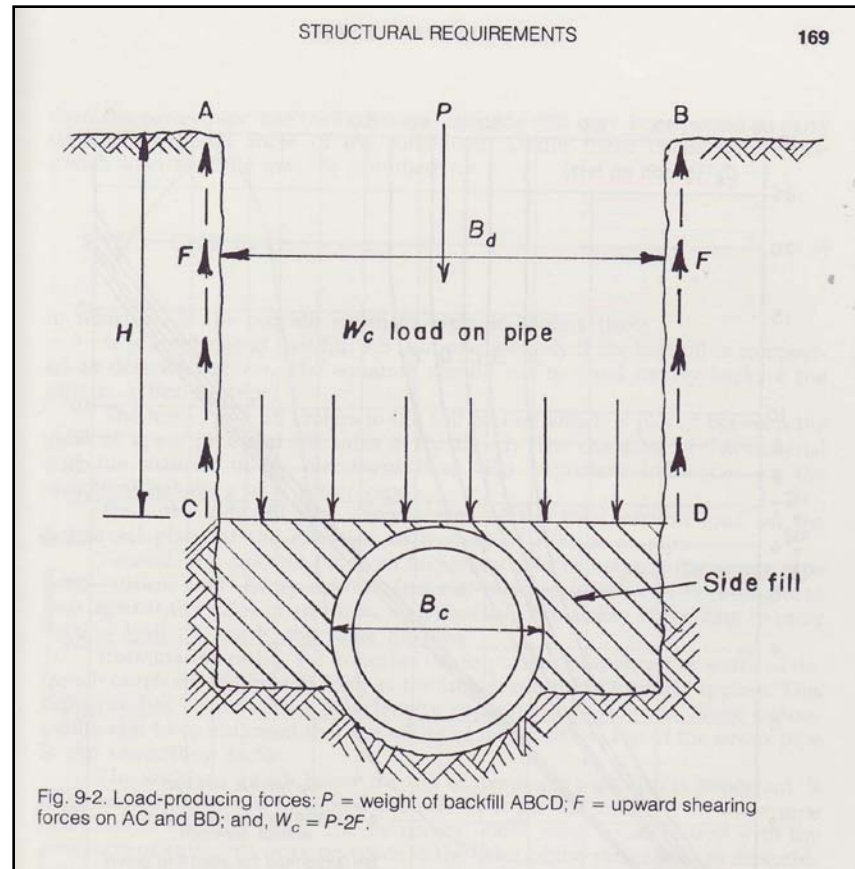




## **PERMACAST® CCCP SHELL DESIGN METHODOLOGY FOR UNDERGROUND PIPE CULVERTS**

- Permacast® CCCP pipe/culvert renewal methodology has been independently reviewed by R&D Engineering. The following procedure provides the appropriate design calculations needed to determine the required liner thickness. This procedure includes the needed components for lining storm culverts and sanitary sewer pipe having various levels and types of duress. This paper presents an overview of the lining process, the materials utilized, and the design thickness required for the composite materials. This process expands the present day technological envelope.
- This complete design review is available upon request.

## Report Graphics Sample



## Report Summary

- This report has proven that a 1 inch liner utilizing the Permaform PL-8000 will perform satisfactorily to support soil and hydrostatic pressure based on the depth, type and diameter of the pipe, soil type and level of the ground water as given above.

# PERMACAST® PL-8,000

- **HIGH STRENGTH, FACTORY BLENDED CEMENTITIOUS LINER MATERIAL DESIGNED FOR RENEWAL OF UNDERGROUND CONCRETE STORM AND SANITARY SEWER PIPE WALL SURFACES.**

- The material, PERMACAST® PL-8,000, shall be an ultra high strength, high build, abrasion resistant and corrosion resistant factory blended and mortar, based on advanced cements and additives. When mixed with the appropriate amount of water, a paste-like material will develop which may be sprayed, cast, or pumped .

- The hardened binder is dense and highly impermeable. The high performance is achieved by a complex formulation of mineral, organic and densifying agents and sophisticated chemical admixtures. Graded quartz sands are used to enhance particle packing and further improve the fluidity and hardened density. The composition also possesses excellent thin-section toughness, high modulus of elasticity and self-bonding. Fibers are added as an aid to casting, for increased cohesion and to enhance flexural strength.

# PERMACAST® PL-12,000

- **ULTRA HIGH STRENGTH, ABRASION RESISTANT MORTAR DESIGNED FOR REPLACEMENT OF DAMAGED INVERTS IN BURIED CONCRETE AND CORRUGATED STEEL STORM PIPE.**
- The material, PERMACAST® PL-12,000, is a ultra high strength, high build, abrasion resistant mortar, based on advanced cements and additives. When mixed with the appropriate amount of water, a self-consolidating material will develop which will easily flow into any area ¼ inch and larger and set quickly with rapid strength gain.
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## **AP/M Success with Manhole Rehab Leads to New ASTM Standard Practice**

- AP/M personnel were invaluable in the creation of a new ASTM Standard Practice.
- ASTMs' F 36 Committee, *Technology and Underground Utilities*, recently developed and released , Standard Practice for Installing a Protective Cementitious Liner System in Sanitary Sewer Manholes, F 2551-09.
- This practice includes the use of the centrifugally cast concrete lining system.

## **Standard Practice for Installing a Protective Cementitious Liner System in Sanitary Sewer Manholes**

- *7.2 Spray Application—Centrifugal Process:*
- 7.2.1 Position the high-speed, bi-directional, rotating applicator within the center of the manhole at the lowest point desired for the new wall and commence pumping the mixed prepackaged cementitious liner material. Man-entry may be required to assure the lining has been effectively applied, as on the underside of any brickwork or around laterals. As the cementitious liner material begins to be centrifugally cast evenly around the interior, retrieve the applicator head at the prescribed speed for applying the thickness that has been selected.

# Sanitary Sewer Rehabilitation





# Concrete Pipe Rehabilitation



## Permacast CCCP

# Cast in Place Structural Product



# Centrifugally Cast Concrete Pipe

**Cleaned/Cast Wall Rehab**



**Specialized Equipment**



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## **Con<sup>mic</sup>Shield<sup>®</sup>**

- **A safe and easy to use liquid additive which molecularly bonds to the concrete for internal corrosion protection.**
- **EPA registration 708712-12.**

## **CS Identifier**

- **A safe and easy to use liquid product that serves as a penetrating sealant, a curing agent, provides additional MIC protection, and acts as a color identifying agent when applied to the surface of the pipe.**
- **EPA registration 708712-12.**

## **Warranty Statement**

- AP/M Permaform products have an impressive record of performance spanning over 24 years and can be specified with confidence.