

HOW DO WE FIX THAT MANHOLE?

By H. Robin Losh



Water distribution systems and wastewater sewer systems are a critical component of urban development. Most people don't think about it, but they function as a key part of our public health system to minimize communicable disease and keep our communities clean and attractive. Unfortunately, the Cities and County utilities that operate these infrastructure systems are struggling. They have not received funding for several years, which is necessary to support adequate maintenance programs for their facilities. This is a fact that has been documented on numerous occasions by many industry and professional organizations.

Inadequate funding for upgrades or common maintenance has resulted in the overutilization of infrastructure systems. Many systems continue to be used well beyond the system service life. The owner is then faced with the question of replacing or renewing the existing system. Today, much of our aging water and wastewater systems operate in highly developed areas, so the cost to dig them up and replace them can be very costly. This leaves the renewal of the existing system as the most frequently chosen option. As an example, Chastain-Skillman, working with the City of Bartow, has recently developed such a rehab project at the Bartow Municipal Airport.

The Bartow Municipal Airport was originally constructed during World War II as an aircraft pilot training base. When the training facility closed, the City of Bartow acquired the site and developed an airport and an industrial park. As industries located there, they utilized the existing street, drainage, water and wastewater systems. Over the past 70 years, the vitrified clay pipe and brick structures that make up the wastewater collection system have been subjected to the damaging effects of hydrogen sulfide, high groundwater and redevelopment construction activities. Manhole structures are a critical part of that system. They are necessary to provide access to the sewers, themselves, for hydraulic, operation and maintenance purposes. However, they are prone to deterioration over time and must be properly monitored and repaired to eliminate other - more serious - problems.

With many options to consider, it might be helpful to offer a quick review of some of the rehab systems available. Each rehabilitation system is tailored to address the specific structural damage and environment encountered. Depending on the data source referenced, it is estimated that 30% to 60% of all wastewater systems inflow/infiltrations (I/I) results from groundwater entering the system at manhole structures. Before implementation of any of the major manhole interior rehab systems, groundwater flowing into the structure should be stopped. If the exterior of the structure is exposed, breaches of the structure or chimney wall can be sealed with rubber or poly wraps and mastics. Waterproof grouts or bituminous sealants can also be used to repair and seal the exposed exterior chimney walls. If the chimney exterior can not be exposed, the injection of chemical grouts through the structure wall or surface application of hydraulic cement can be very effective.



Once the inflow of water is stopped, repair of the interior walls can begin. Again, there are numerous options to consider. These options fall into two primary installation categories: coatings and liners. These categories can be further separated by the material selected for the system and by the system's unique performance characteristics. Let's look at some of the options for coatings first.

One of the least expensive coating systems is Bitumastic, also known as coal tar, applied to a thickness of 32 mils over new mortar surface. This system is used mainly for new construction and where budget constraints are high. It has little or no structural value and limited

performance characteristics. Also, this product is no longer approved for use in some areas of the country due to environmental and occupational health considerations.

Another coating system is the cementitious group made up of calcium aluminate mortar or polymer modified mortar. These systems can be applied via trowel, spray or pump to a thicknesses of 1/4" to 2"; some are fiber

reinforced. These systems have good structural properties and perform well in an environment with low hydrogen sulfide and no infiltration. Environments that have high concentrations of hydrogen sulfide require coatings that are typically sealed or enhanced with additives.

The last of the coating systems in this discussion are the epoxy, polyurea, polyurethane or polymer resin systems. These systems can be applied via trowel or spray. They have good structural properties, but vary significantly in application thickness depending on the manufacturer. These systems also have excellent performance characteristics in high hydrogen sulfide and high groundwater environments. They are, however, the more expensive of the coating systems in initial cost.

Next we consider the liner systems. Liners are usually either inserts or cured-in-place liners. The insert family of liners are made from several different materials. Steel, fiberglass, polyethylene and ABS are among the more popular materials. These inserts are made to either remain in place or, acting as an internal form, be removed after filling the annular void between the insert and existing structure wall with concrete. These poured concrete liner systems are intended to add structure back to the manhole chimney wall. In cases where new concrete is exposed in the manhole interior, sealing or coating may be appropriate.

Cured-in-place liner (CIP) systems are similar in nature to the family of cured-in-place pipe (CIPP) rehab systems. They are comprised of a fabric liner material fabricated to fit the internal surfaces of the manhole. This fabric is then impregnated with a resin or epoxy that cures under pressure and/or with heat. The liner is installed using water, steam or a pneumatic bladder to hold the liner against the structure's surfaces. As with all liner and coating systems, CIP liners require cleaning of the interior surfaces prior to installation. However, once the interior surfaces are cleaned, CIP liners form and bond directly to the existing surface. They are structural and perform very well in environments with high hydrogen sulfide and high groundwater.

Rehab system manufacturers have responded to the needs of the utility industry with a large selection of options. Walking through this maze of options can be confusing. Before the final selection is made, the elements of structure condition, environment, anticipated service life and life cycle cost, just to name a few, must be considered. Also, there is the question of who manufactures the products in each of these categories and how to contact them for product information. Trenchless Technology Center at Louisiana Tech University has provided an extensive listing of manufacturers and products available for rehabilitation of manholes. A helpful summary entitled, Currently



Available Products and Techniques for Manhole Rehabilitation, can be found on the Internet at <http://www.ttc.latech.edu/publications/other/manhole.availableproducts.pdf>.

Robin Losh is a Senior Project Manager in the Environmental Engineering Department of Chastain-Skillman's Tallahassee Office and has been with the firm for 23 years. He can be reached at (850) 942-9883 or rlosh@chastainskillman.com.

© 2011 Chastain-Skillman, Inc. This article is taken from the 4th quarter 2011 issue of Consultant's Update, a publication of Chastain-Skillman, Inc.