2019

STANDARD OPERATING PROCEDURE

01116 County Road 17 • Bryan, OH 43506 • Office 419-633-3147 • Fax 419-636-7437

STANDARD OPERATING PROCEDURES

Contents

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About Sewer Rehabilitation

Wastewater structures are built out of many different materials, such as brick, concrete block, pre-cast concrete forms, and steel. These materials are adversely affected by wastewater. Running water and gasses created by the wastewater corrode and erode different parts of the structures leading to the need for repair. A badly corroded or eroded structure will continue to get worse and could cause a safety hazard to the public around the area. Coatings are applied in order to protect and rehabilitate those structures. There are many reasons structures are in need of repair and those reasons vary from structure to structure. If not fixed, the structure eventually becomes too weak to stay in place and collapse. A collapsed structure could cause a sinkhole and cause a blockage in the wastewater system. A failure would cause wastewater to damage houses with wastewater and sending raw sewage into the environment.

Another cause of structure failure is the freeze-thaw cycle. Ground water pressure can also cause the structures to crack and/or leak. These leaks need to be repaired because wastewater treatment plants pay to process the wastewater by the gallon. With the extra ground water infiltrating into the system, it raises the cost to the community.

OBIC

OBIC is a Latin word that means barrier. That is the essential foundation that OBIC was formed from, to be a barrier. A barrier that keeps water from leaking in or out of the structure. A barrier that keeps hazardous gasses or chemicals from degrading the integrity of the structure. OBIC was established in 2018 by a founder who has over 10 years' experience in the polyurea lining business, with the help of polyurea specialists who have over 40 years of experience alone and hundreds of years combined. OBIC was started to provide a product that is uniquely better than any other coating on the market. We want to provide a product that performs better and meets the individual needs and specifications of our customers.

"When it absolutely, positively must last."

OBIC is a municipal, industrial water and wastewater systems maintenance company. We specialize in providing an alternative, no-dig approach to repairing holding systems, manholes, treatment facilities, vaults and other structures with damage caused by infiltration or corrosive chemicals.

OBIC products are innovative solutions designed specifically for Severe Service and USDA Food & Beverage compliant applications. Potable water approved for NSF/ANSI 61 barrier material, the

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polyurea application adheres extremely well to properly prepared metal, wood, concrete fiberglass and other various metal surfaces.

OBIC is the brand name of high-quality coating materials. OBIC is based on polyurea and polyurethane protection systems, most often applied to sanitary sewer, potable water, storm water structures and bridge decks. OBIC has several different systems designed to meet the demands of these individual structures.

OBIC's three-layer system is composed of a 50-mil thick first adhesion layer of OBIC 1000 fast gel polyurea, a 400-mil thick layer of OBIC 1306 high-density polyurethane foam, and a 50-mil thick moisture barrier layer of OBIC 1000 fast gel polyurea. This creates a 500-mil thick coating that provides chemical protection, leak protection, and structural support. The polyurea is bright orange in color. This creates a highly reflective surface that makes structure inspection easier from ground level.

Depending on the application, single layer systems will vary. OBIC 1200C is the single layer system that is most often applied to storm water systems, such as culverts. The thickness of this varies, anywhere from 50 to 250 mils or more. OBIC 1200C is typically gray. OBIC 1100PW is a single layer system that is potable water approved. Much like the 1200C, the thickness of 1100PW varies on the job. OBIC 1100PW is Blue. OBIC 1306 is a polyurethane foam that can be applied to storm sewer catch basins in order to protect them from degradation.

Sewer and Waterline Applications

OBIC products offer a fast, easy and cost-effective solution for repairing and preventing damage to municipal and industrial sewer and potable water systems. Made of a flexible polymer that is environmentally friendly, OBIC products are spray applied and cure in minutes. Frequently used to rehabilitate partially deteriorated clarifiers, pump stations and storm water culverts, OBIC can also provide solutions that will proactively prevent future maintenance problems. Unlike alternative rigid products, OBIC's flexible polymers will not crack under the pressure of temperature changes or heavy traffic. They are designed to be flexible enough to withstand the demands of the host structure and durable enough to last for decades.

Food and Beverage Compliant Applications

It is inevitable that deterioration occurs in any water system. Short-term fixes like paint or cover up only offer a temporary solution. OBIC offers faster solution that is, not only long lasting but also a solution that has minimal downtime.

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OBIC Product Line

OBIC **Product Name**	**Product Description**	**Applications**
OBIC **Armor Wastewater**	**Pure Polyurea**	
OBIC 1000F	Fast Gel Polyurea	Manhole, Pump Stations, Wet Wells, Clarifiers, Weir Trough
OBIC 1100	Standard Polyurea	Manhole, Pump Stations, Wet Wells, Clarifiers Secondary Containment, Waterproofing, Industrial Coatings
OBIC 1200	Polyurea Hybrid	Storm water culvert and large diameter pipe lining, steel and concrete pipe, industrial applications. Applications for area's where abrasion resistance is important to customer and flexibility is not as critical
Stormwater	**Culvert Lining /Structural**	
OBIC 1200C	Polyurea Hybrid	Storm water culvert and large diameter pipe lining, steel and concrete pipe, industrial applications
Potable water	**Potable Water Polyurea**	
OBIC 1100PW	Standard Polyurea	Potable water tank lining, Water Treatment, Canning & Bottling plants
Top Coats	**Polyaspartic**	
OBIC 1150	OBIC Topcoat 65D	Topcoat materials for UV resistance product.
OBIC 1151	OBIC Topcoat 72D	Top coat materials for UV and Chemical resistance product
OBIC Guard	**Spray Foam**	
OBIC 1300	3.0pcf polyurethane foam	High build foam for seamless spray applied foam.
OBIC 1306	6-8 pcf polyurethane Hybrid	High strength backing material for stabilizing surface in multilayer liner system application
OBIC Prime	**Primers**	

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OBIC 1500 C	Concrete Primer	Primer for large diameter or high square footage concrete surface area to be coated.
OBIC 1500 CP-F	Concrete Primer - Fast	Primer for large and small diameter or square footage concrete projects. Fast cure time allows application of polyurea coating system to begin installation sooner.
OBIC 1503 S	Steel Primer	Urethane primer for steel substrate surfaces
OBIC 1505 PW	Potable water primer	Potable water primer
OBIC Repair	**Prep / Patch**	
OBIC 1600	Surface Prep	Surface prep solution for promoting inter-coat adhesion between successive applications of polyurea coatings
OBIC 1601	Patch Material	Repair/Patch material for durable seamless repair to existing containment system
OBIC Clean		
OBIC Flush	Pump Flush and Cleaner	Flush material for plural component systems without threat of damage to pump O-rings and gaskets.
OBIC Solv	Parts cleaner and dissolvent	Cleaning /dissolvent product for cured and uncured isocyanate materials.

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The OBIC Advantage

"When it absolutely, positively must last."

Rest assured OBIC products are:

- Backed by a team of chemists who ensure consistent quality.
- ISO 9001:2015 Certified Manufacturing Company.
- Proven to be physically stronger than similar products.
- Include potable water system solutions that are approved for NSF/ANSI 61 barrier material.
- Are applied with minimal downtime and greater protection than thinner, more rigid materials.
- Offer significantly longer service life, allowing for a greater return on investment.
- Customizable to provide solutions for customers with unique needs.

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An Intro of Coatings Technology

A Brief History of Polyurethanes

Polyurethane can be defined as the result of a chemical reaction between an isocyanate (A-side) and a polyol (B-side). It is important to realize that polyurethane requires the use of a catalyst to complete the reaction in a timely manner.
The origin of polyurethane materials dates back to the beginning of World War II where it is was first developed as a replacement for rubber. The versatility of this new organic polymer and its ability to substitute for scarce materials, spurred numerous applications. During World War II, polyurethane coatings were used for the impregnation of paper and the manufacture of mustard gas resistant garments, high-gloss airplane finishes and chemical and corrosion resistant coatings to protect metal, wood and masonry.

By the end of the war, polyurethane coatings were being manufactured and used on an industrial scale and could be custom formulated for specific applications. By the mid-50's, polyurethanes could be found in coatings and adhesives, elastomers and rigid foams. It was not until the late 50's, that comfortable cushioning flexible foams were commercially available. With the development of a low-cost polyether polyol, flexible foams opened the door to the upholstery and automotive applications we know today. Formulations, additives and processing techniques continued to be developed such as reinforced and structural moldings for exterior automotive parts and one-component systems. Today, polyurethanes are found in virtually everything we touch – our desks, chairs, cars, clothes, footwear, appliances, beds, wall insulation, roof and moldings on our homes.

The Invention of Polyurea

Polyurea is a chemical reaction between an isocyanate (A-side) and an amine (B-side). This is also commonly referred to as a reaction between an MDI, or HDI pre-polymer with amine-terminated resins. Polyurea's have some unique physical properties in comparison to polyurethanes. For the most part, polyurea's will react very quickly without the need for a catalyst. Furthermore, polyurea's are not as sensitive to excessive humidity or surface moisture. The amine-terminated polymer reacts so quickly that the isocyanate does not have a chance to react to any moisture. As a result, there is little if any chance of "foaming". This can be an advantage in contractor-based applications (roofing, waterproofing, etc.) where high humidity is common.

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Other Coating Materials

Acrylic

Acrylic compounds are thermoplastic (able to soften or fuse when heated and re-harden upon cooling), impervious to water, and have low densities. These paints and coatings ensure protection against sun, mildew and bad weather conditions. These qualities make them suitable for the manufacture of a variety of objects and substances, including molded structural materials, adhesives, masonry, metals, and wood and textile fibers. Acrylics dry quickly without changing color and do not darken with time.

Epoxy

Epoxy is a synthetic resin used as an adhesive and as an ingredient in paints and coatings. These products come in the form of adhesives, paints and coatings and they consist of two separate components: Resin and a curing agent or hardener (Part B). The two chemicals are mixed just before application, and the mix sets hard.

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Glossary of Terms

ALIPHATIC

Organic compounds in which carbon atoms form open chains (as in the alkanes), not aromatic. These compounds will not degrade due to UV exposure.

AROMATIC

(Of an organic compound) containing a planar unsaturated ring of atoms that is stabilized by an interaction of the bonds forming the ring. These compounds are subject to UV degradation.

BASE FLOW

Wastewater flow (including a reasonable amount of inflow and infiltration) originating from residential, commercial and industrial sources.

CALIBRATION

The determination, checking, or rectifying of the graduation of any instrument giving quantitative measurements. With respect to a computer model, calibration is a process whereby data recorded during an actual event is compared with data derived from a computer simulation of that event in order to determine the accuracy of the simulation.

CASTING

The metal, or HDPE, top of a manhole that the cover (lid) sits on. Also referred to as the Frame

CHIMNEY

The area of a manhole that is roughly the same diameter as the casting (+/- 24") that connects the casting to the primary manhole structure.

CLEAN WATER ACT (CWA)

Also known as the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.).

CLOSED-CELL FOAM

A type of spray foam that is denser than the open-cell form. It is more moisture resistant and considered a vapor retarder unlike open-cell. The density is usually at least 2lb per cubic foot. This foam is considerably more expensive than open-cell.

COATINGS/PAINTS

A layer of material that is used to provide a protective or decorative finish to a substrate.

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COLLECTION MAIN

In collection systems, this is a larger pipe in which smaller branch and submain sewers are connected. The collection main may also be called a main or trunk sewer.

COLLECTION SYSTEM

In a wastewater system, a collection system is a system of pipes that receives and conveys sewage and/or storm water.

COMBINED SEWER OVERFLOWS (CSOS)

Overflows, during wet weather, of combined wastewater and storm water. CSOs happen when flows in the wastewater collection system exceed the capacity of that system. The term "CSO" is also sometimes used to denote a pipe that discharges those overflows.

COMBINED SEWER SYSTEM

A wastewater collection and treatment system where domestic and industrial wastewater is combined with storm runoff.

COMBINED SEWERS

A sewer that carries both sewage and storm water runoff.

COST-EFFECTIVE ALTERNATIVE

An alternative control or corrective method identified after analysis as being the best available in terms of reliability, performance, and costs.

CSO TREATMENT PLANT

A plant designed to provide primary treatment of combined sanitary sewage and storm water for peak flows above the 2.25 times the average wet weather flow. Such plants operate only intermittently, unlike most wastewater treatment plants that operate continuously.

DETENTION

The process of collecting and holding back storm water or combined sewage for delayed release to receiving waters.

DISCHARGE, DIRECT OR INDIRECT

The release of wastewater or contaminants to the environment. A direct discharge of wastewater flows from a land surface directly into surface waters, while an indirect discharge of wastewater flows into surface waters by way of a wastewater treatment system.

DISINFECTION

A chemical or physical process that kills organisms, which cause infectious disease. Chlorine is often used to disinfect treated sewage.

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DIURNAL BASE FLOW

Two peaks in the wastewater flow within the wastewater system in a single day.

DOMESTIC WASTEWATER

Human-generated sewage that flows from homes and businesses.

EFFLUENT

Treated water, wastewater or other liquid flowing out of a treatment facility.

ELASTOMER

A material that can be elongated when stretched many times its original length and then it will return to its original length when the stress is relieved. Polyurethane technology allows for a wide variety of elastomers to be created with elongation ranging from 50-700%. Typically, a polymer is considered an elastomer when it has elongation greater than 100%.

ENVIRONMENTAL ASSESSMENT

A written environmental analysis that is prepared pursuant to the National Environmental Policy Act to determine whether a proposed action would significantly affect the environment and thus require preparation of a more detailed environmental impact statement.

ENVIRONMENTAL IMPACT STATEMENT (EIS)

A document that discusses the likely significant impacts of a development project or a planning proposal, ways to lessen the impacts, and alternatives to the project or proposal. EIS's may be required by national and state environmental policy acts.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

A federal agency established in 1979 by presidential executive order to control pollution of the environment.

FECAL COLIFORM BACTERIA

A group of organisms common to the intestinal tracts of humans and animals. The presence of fecal coliform bacteria in water, wastewater, or bio solids is an indicator of pollution and possible contamination by pathogens.

FINAL DESIGN

The final phase of a project's design process. During final design, contract plans and specifications necessary for bidding are prepared. These contract documents provide all the necessary information needed by suppliers and contractors to construct the facility.

FORCE MAIN

A pipeline leading from a pumping station that transports wastewater under pressure.

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GROUNDWATER INFILTRATION

Infiltration that enters the sewerage system through pipe defects located below the normal groundwater table

HYDRAULIC

Pertaining to the energy, momentum, and continuity effects of liquid in motion. The term usually refers to the flow of liquids in natural environments such as rivers or manmade structures such as pipes.

HYDROLOGY

The science dealing with the properties, distribution and circulation of water. The term usually refers to the flow of water on or below the land surface before reaching a stream or manmade structure.

INFILTRATION

The penetration of water from the land surface into the soil, or the penetration of water from the soil, into a sewer system, by means such as defective pipes, pipe joints or connections, or manhole walls.

INFLOW

Flows of extraneous water into a wastewater conveyance system from sources other than a sanitary sewer connection, such as roof leaders, basement drains, manhole covers, and cross-connections from storm sewers.

INFLUENT

Water, wastewater or other liquid flowing into a reservoir, basin or treatment plant.

INFLUENT PUMP STATION

A pump station that pumps flow from an interceptor sewer into a treatment plant.

INFRASTRUCTURE

Streets, water, sewer lines, and other public facilities basic and necessary to the functioning of an urban area.

INTERCEPTOR SEWERS

The portion of a collection system that connects main and trunk sewers with the wastewater treatment plant, thereby controlling the flow into the plant.

INVERT

Half-Pipe shaped area on bottom of structure where waste flows.

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LATERAL SEWERS

Pipes that receive sewage from homes and businesses and transport that sewage to trunks and mains.

OPEN-CELL FOAM

This is a spray foam that has a density of about .5 lb. per cubic foot. It is not moisture resistant like closed-cell foams. It should not be used in areas where moisture is common, or possible. Open cell foam is not a vapor retarder, so if it is used as an insulation it needs to have some sort of moisture barrier put up with it.

POLYUREA

A type of elastomer that is derived from the reaction product of an isocyanate component and a synthetic resin blend component.

POLYURETHANE

A synthetic resin in which the polymer units are linked by urethane groups, used chiefly as constituents of paints, varnishes, adhesives, and foams.

VAULT/ CHAMBER

Part of a structure that is most often either larger than the rest of structures or a structure that is used primarily as an area to access equipment such as valves or pumps.

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Overview of commonly used equipment and materials

Proportioners

These machines pump the material to the gun from the truck.

PMC PHX 25 OR PHX 40

Heated Hoses

These are the 50ft sections of hose that carry the material from the proportioner to the spray gun. They contain 2 material lines that have a wire running around them to heat them up, an airline, and a purple wire that sends information from the hose block back to the machine.

Temperature Sensing Unit (TSU)

This is commonly referred to as a hose block. A piece that connects between two hoses. It gathers the information to be sent back to the proportioner. It has a small probe, which reads the material temperature. This block most often goes between the heated hose and the heated whip hose. It may be moved one section of hose back and go between the last two sections of heated hoses.

Heated Whips

The 10ft section of heated hose at the end of the line between the heated hoses and the whip hoses. This hose has 2 heated material lines and an airline running through them. It does not have the purple wire (Thermocouple wire).

Gun Whip

The gun whip is the hose that connects the heated whip to the spray gun. It is usually 4-6 feet in length and 3/16" in diameter. A smaller hose is easier to maneuver in tight quarters.

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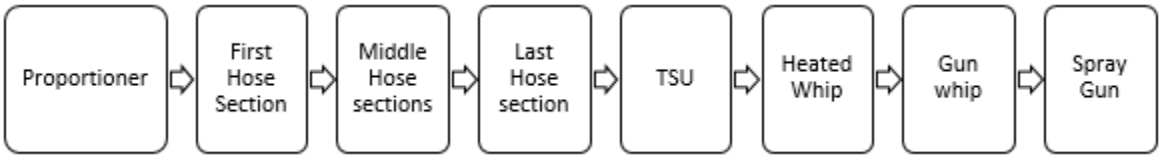

Spray Guns

There are four types of guns used in spray application.

Graco GapPro
Air Purge gun used for Foam

Graco GX7 DI
Mechanical Purge gun used primarily for Polyurea

Graco Fusion AP
Air Purge gun used for Foam or Polyurea

Glascraft Probler P2
Air Purge gun used for Foam or Polyurea

Gun Parts

Module

The piece inside a spray gun where the two chemicals meet to be sprayed out as one. Different Guns have different types of modules; they can be plastic, metal, round, rectangular, or square.

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Block

Front part of the gun that houses the module.

Side blocks

Two pieces that attach to either side of the block of the gun. Each side block is where one of the materials enter, either the Iso or the Resin.

Barrel

Back part of the gun that contains the piston. This controls the operation of the gun.

Handle

The part of the gun that an individual holds on to in order to operate the gun. It is where the trigger housing is and where the trigger attaches.

Heater

Heat Wagon HVF 210 or HVF 310

Indirect fired air heaters used to dry surfaces to be coated.

Air Compressors

Hydrovane

Direct drive air compressors found on some trucks.

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Grout

OBIC 2090 or OBIC 2290 MultiSeal

This is a low viscosity crack and joint filler used routinely for manhole sealing and pipe penetrations. It is a single component; moisture activated MDI/TDI blended polyurethane injection resin. OBIC 2090 MultiSeal can withstand high water flows as it can absorb up to 10 times its weight in water. It is designed to permeate tight cracks or joints and cures to form a resilient and flexible, yet tough, closed-cell foam with superb adhesive qualities. Reaction time is 90 seconds to 10 minutes. OBIC 2090 is available in 5gallon pails and OBIC 2290 is available in tubes.

OBIC 2060 MaxSeal

Injected as a single component, OBIC 2060 MaxSeal is a moisture activated MDI-based polyurethane resin. The chemical reaction of this product is conditioned by using OBIC 2060C MaxSeal Conditioner and uses moisture as an initiator. It was designed to bind together and waterproof loose granular soils. OBIC 2060 MaxSeal withstands wet/dry cycles, permeates well, and reacts quickly with water to form a dense, impermeable semi-rigid foam. Reaction time is 1-8 Minutes.

OBIC 2020 UltraSeal

It is a single component; moisture activated, expanding, semi-rigid foam. Designed with soil permeation in mind, it can fill large voids on the exterior of below-grade structures. OBIC 2020 UltraSeal stops high volume leaks due to its fast reaction and high expansion properties. Reaction time is 15-60 Seconds.

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OBIC 2230 HyperSeal

It is water-activated, flexible, hydrophilic polyurethane injection grout. OBIC 2230 HyperSeal is typically used to repair leaks in large and small cracks in wastewater and other structures with continuous water exposure. Reaction time is 30-90 Seconds.

OBIC 2255 FastSeal

OBIC 2255 FastSeal is a moisture intensive, two-component, fast reacting hydrophobic polyurethane grout designed to stop high volume leaks in manholes, pump stations and other waste water structures. The convenient cartridge package allows east access to hard to reach places. The fast reaction time of the material helps to stop water quickly before the resin is washed away. Cure time is less than 20 seconds.

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SAFETY CONSIDERATIONS

There will be multiple safety considerations while working in Advanced Rehabilitation Technology's Coating Division. These are the general guidelines, safety practices, and considerations for employees. Task specific safety considerations and Personal Protective Equipment (PPE) guidelines are listed at the beginning of each procedure. ART will provide safety equipment and PPE. Employees may choose to wear other PPE, it must be OSHA approved and in good working order. Those items will be at the cost of the employee. Full overview of the company safety policy is available upon request.

Personal Protective Equipment (PPE)

The Coating Division is often working in or around traffic areas. Employees must ALWAYS wear reflective gear, ex. safety vest or shirt, and hardhat at ALL times. It is also company policy that boots with a safety toe, composite or steel, must be worn. Additionally, when working in any environment where eye damage is possible, safety glasses must also be worn.

PPE Available

Hard hats	Cloth Gloves
Safety vests	Work Gloves
Eye protection	Blast Shields
Rubber gloves	Grinding Shields
Paper Spray suits	Back support braces
Tyvek Suits	*Others available upon request

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Safety Equipment

This section will contain different pieces of safety equipment that is used. OBIC does not endorse any of the equipment shown in this section. The equipment shown is the equipment currently used or used in the past.

Tripod

This support system sits over a structure that the fall restraint is put on. It has 3 legs, hence the name tripod. It is used as a fall protection device.

Fall Restraint

This device attaches to a tripod and has cable coming out of it that attaches to the harness worn by a confined space entrant. This device stops the individual by fall by a mechanism that dispatches when the cable goes out at too fast of a speed. It has a winch on it as well for emergency rescue. This is not to be used under non-emergency conditions.

Material Winch

A winch can be used to lower and raise the entrant in the hole. It has a crank handle and an area where the cable is stored. It should not move without someone moving the handle. The cable attaches to the harness of the entrant.

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Harness

A harness is a piece of equipment that the entrant wears. It connects to the fall restraint and/or winch cable. This goes on the entrant around shoulders and legs at a minimum. It must be inspected before each use and maintained correctly.

Air Tester

An air tester takes a sample of the air in its given atmosphere and tests the air for a set number of contaminates.

CO monitor

A CO monitor is in the supplied hood airline. It tests the air that is going to the hood to ensure that CO2 is not pumped into the hood. Bullard manufactures a reliable model.

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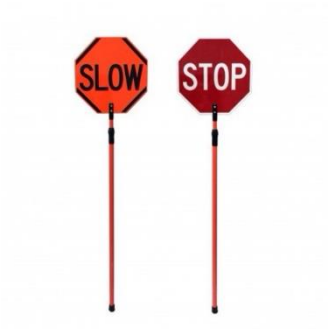
Maintenance of Traffic (MOT)

In addition to PPE, Maintenance of Traffic (MOT) is often an important piece of the safety aspect. MOT must be considered when working on or near right-a-ways. On lower volume roads, traffic cones alone may be sufficient. In many situations, more items will be necessary to ensure the safety of the workers and the public. It is important to remember to err on the side of caution when setting up a work area.

MOT Items

Traffic Signs	Delineators	Traffic Barrels	Sign Boards
Arrow Board	Light Panels	Stop/Go boards	Flags



Unsure what MOT is required for the specific job? Contact leadership for direction. Individual municipalities or states may have specific MOT rules that must be followed.

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SURFACE PREP AND COATING PROCEDURES

These checklists are the method in which accountability for maintenance of equipment is maintained. Equipment that is needed to properly and efficiently complete jobs. These lists are not all encompassing. They are, and will always be, working documents. OBIC does not accept accountability for the adherence to these guidelines, nor does OBIC accept responsibility for events that may happen due to the adherence to these guidelines.

PPE recommendations made in this section are only recommendations. Individuals and entities performing any of these procedures assume responsibility for appropriately choosing PPE.

Checklists

Daily

- ✓ Truck Oil level
- ✓ Truck coolant level
- ✓ Truck transmission fluid level
- ✓ Truck fuel level
- ✓ Tire pressures
- ✓ Visually inspect for leaks
- ✓ Lights on trucks
- ✓ Generator fuel level
- ✓ Generator oil level
- ✓ Generator coolant level
- ✓ Generator belt
- ✓ Air compressor oil level
- ✓ Generator leaks
- ✓ Air compressor leaks
- ✓ Air leaks in any air lines
- ✓ TSL levels on pumps
- ✓ Color of TSL on pumps
- ✓ Truck belts for wear and tear
- ✓ Check Fluid Inlet Filter Screens (Daily, weekly, monthly)
- ✓ Check for leaks (air or liquid)
- ✓ Clean Gun! (clean gun is a happy gun!)
- ✓ Clean Mix chamber and gun internals
- ✓ Check for scratches on side seals or chamber (if scored replace both, always use new side seals with new mix chamber)
- ✓ Apply Lithium Grease to Gun after spraying
- ✓ Desiccant beads for color
- ✓ Wear and tear of hoses
- ✓ Condition of all tools and equipment used

Weekly

- ✓ Air compressor air filter
- ✓ Material levels on trucks
- ✓ Pressure washer oil
- ✓ Screens on pumps
- ✓ First aid kits
- ✓ Next service due for all equipment (oil change, filter change, etc.)
- ✓ Lithium grease zerks on proportioner.
- ✓ Fire extinguishers
- ✓ Eye wash kits
- ✓ MSDS books
- ✓ Tool box talks
- ✓ Ventura crane cable for fraying
- ✓ If proportioner has felt wipers, soak them liberally with TSL fluid
- ✓ Check Hydraulic Fluid level

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Monthly

- ✓ Perform a stall check on proportioner to verify internal pumps seals
- ✓ Check that all fans are operating (electrical cabinet and motor)
- ✓ Blow down electric motor fan with dry compressed air
- ✓ Verify all electrical wiring is firmly secured to breakers and circuit boards (this may be a daily/weekly check for mobile units)
- ✓ Heated Hose – look at connections for leaks, tighten as needed.
- ✓ Check for broken electrical connectors and verify all connections are secure (mobile rigs)

Bi-Annual/ Annual

- ✓ Hydraulic proportioners (change fluid and filters)
- ✓ Transfer/ Stick Pumps (Replace seals on upper and lower as necessary)
- ✓ Review spray gun history. Problematic guns should be evaluated for root cause of primary difficulty. They do not last forever; internal orifices wear and degrade over time and vigorous cleaning techniques (**no power tools please**)

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General overview of Daily Work for Coating Truck

When working with OBIC materials it is recommended that all relevant personal protective equipment (PPE) be worn. There will be times additional PPE may be required.

Recommended Mandatory Minimum

- Hard hat
- Reflective shirt or vest
- Steel toe boots
- Eye protection

Additional PPE required for different procedures

- Ear protection
- Rubber boots
- Tyvek suit
- Air supply hood
- Rubber gloves
- Safety harness
- Cloth gloves

Overview of daily process for working with OBIC

Beginning of the day:

- Start truck to warm up to move to structure location.
- Let the site contact know when you will be there.
- If travel time is less than 30 minutes, start the generator.
- If travel time is more than 30 minutes, start generator upon arrival. If the temperature is below 15 degrees, talk to leadership about the generator running while driving.
- Once the generator is running, turn proportioners (pumps) on and turn hose heats on.
- In wintertime, turn off space heater and put away.
- Arrive and park in a safe or assigned spot. Do not park somewhere without permission. Assigned spot may be:
    - Equipment yard
    - Hotel parking spot
    - City parking lot
- Put up all MOT requirements (cones signs, barrels etc.)
- Test the air in the structure.
- Fill out confined space entry sheet.
- Take picture of sheet.
- Take site picture.
- Take picture of hole.
- Set up tripod.

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- If hole has not been prepped already, then prep the hole
- Once hole is prepped use heater or torch and fan to dry hole.
- While hole is drying:
    - Clean gun
    - Suit up
    - Prep helmet
    - Prep air hoses
    - Clean equipment as finished.
    - Prep rebar
    - Prep stamps
    - Prepare camera
    - If leak stop is necessary, prepare needed materials and equipment.
    - Stop leak, if necessary
- Dry hole again, if necessary.
- Turn on pumps
- Pull out hoses
- Line hole
- Take all pictures
- Polyurea layer
- Foam layer
- Take final picture
- Have 2nd person check the hole.
- Drain pressure from guns and put hoses away.
- Put all equipment away.
- Fill out Manhole field report.
- Take picture of paperwork.
- Pick up all equipment and materials.
- Double check work area, pick up trash and discard.
- Move to next structure and repeat process.

At end of day or current job:

- Turn off generator.
- Set heater if the temperature is below 50°F (not if you are still traveling).
- Drain air from tanks.
- Close valves when air is drained.
- If traveling put crane down to travel position.

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Box Truck Generator Procedure

Safety Procedures

Wear all recommended PPE and follow all procedures concisely and correctly. Ear Protection may be necessary if in generator room for extended period.

Daily Procedure

- Go into generator room in truck:
    - *If it is winter, first step is to remove covers from louvers.
    - Check oil level in generator.
        - Oil level should be somewhere in the crosshatches on the dip stick.
    - Check coolant level.
        - Coolant should be 1-2" below cap.
    - Check oil level in air compressor.
    - Refill to desired level before starting generator, if necessary.
- Visually inspect underside of compressor and generator for leaks.
- Check that air drain ball valves on nurse tank and respirator filter are closed.
- Ensure room is clear of debris.
- Turn key to left for 5-10 seconds to warm up glow plug.
- Turn key all the way to the right to start position and start generator.
- Return key to on position.
- Inspect generator area to ensure no fluids or air leaking from anywhere.
- Turn on air compressor.
- After the air compressor has run for at least 60 seconds, turn the Air Dryer on.

Weekly steps to add to start up procedure

1. Check desiccant bead filter to ensure beads are good. Replace beads when indicator turns from translucent blue to white in color.
2. Check air filter on air compressor.
    a. Knock out any debris in the filter.

Procedures while the generator is running

1. Open the valves on the nurse tank and the respirator filter every 3-4 hours and drain for 5-10 seconds.
2. Visually inspect generator and generator area for any leaks or debris.
3. Audibly inspect generator for any noises or rattling that is not normal.

Shut down procedures

When done with all equipment:

1. Ensure all electrically powered equipment is shut off.

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2. Turn off Air Compressor.
3. Turn off Air Dryer.
4. Turn off Generator.
5. Open air drain ball valves on the nurse tank and respirator filter and drain the air.
6. Open air drain valves on top of material tanks and drain air.
    a. Close valves after air has drained out.
7. *IN WINTERTIME*
    a. Put cover on the louvers to prevent the cold air from getting in the truck.
    b. Put portable heater in tank/pump room and turn on.

Approaching, Set-up, and Leaving a Work Site

Safety Procedures:

Wear all recommended PPE and follow all procedures concisely and correctly. Identify and safeguard from any hazardous traffic conditions.

Arriving at the work site

1. Determine where the work site is and go to that site.
2. While approaching site, look to ensure that there is a safe place to park.
    a. Try not to block any driveways.
    b. If there is a blocked driveway, inform the owners.
3. If it is not possible to safely park on the site or MOT items need set up, park the equipment at a nearby safe staging area (Side road, parking lot, etc.)
    a. If truck is placed in a staging area
        i. Gather any MOT items necessary and place in the pick-up truck.
        ii. Go to the site and set up the appropriate MOT items.
    b. Knock on doors and try to have any vehicles in the way relocated if it is necessary.
4. Park the truck in the identified spot.
5. Immediately set up cones around your work area.
    a. If is on private property, knock on the door to let the property owner know about the work and that access the structure located on their property is required.
6. Follow guidance of the Supervisor, Project Manager, or Site Inspector on how to proceed if there is no answer.
7. Take manhole hook, rope and air tester to structure.
8. Move any obstacles around the structure to make safe work possible around structure.
    a. Plants, decorative items, or any other moveable items should be neatly and carefully placed aside.

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b. Seek further guidance if the obstacle is permanent or semi- permanent. One example of this is a fence located over the hole.

9. Test the atmosphere
    a. Ensure that air tester is calibrated and working properly.
    b. Open structure.
    c. Attach air tester to rope and test the atmosphere of the structure.
    d. Use fan or other means to circulate air to ventilate structure if the air is unsafe.
    e. Record your findings on Confined Space Entry Permit.
        i. **Fill out a confined space entry permit if any portion of either crew member enters the STRUCTURE.**
10. Begin to set up for work if air passes test.
    a. If the air did not pass can begin to set up as well but entrance into the structure is prohibited until air passes test.
11. Set up tripod and fall restraint, if necessary.
    a. Required for any structure over 4 feet deep.

See Surface Preparation Procedure

Leaving the work site

1. Clean work area of trash and debris
    a. Return all moved items to original position
2. Pick up the cones, put them away, and move to next site repeating process if the only MOT considerations are traffic cones.
3. If there are additional MOT considerations in place
    a. Move truck to safe staging area.
    b. Take Pick-up truck and go remove all remaining MOT considerations.
    c. Be sure to remove in an order that would not confuse or danger drivers or workers.
    d. Move to next structure and repeat process once all MOT has been removed.

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Surface Preparation

Filling Box Truck Water Tanks

Safety Procedures:

Wear all recommended PPE and follow all procedures concisely and correctly. Watch where any water may be spilled as it may cause an area where someone can slip and fall. Be attentive to the area around the hydrant and that the truck is parked in safe location while filling.

NOTE: Never fill with water from an unauthorized source.
Ensure valves are in correction position before beginning to fill.

1. If tank is pressurized:
    a. Drain air pressure from water tank.
    b. Close air supply valve.
    c. Open air drain valve.
2. Connect water source via water hose.
    a. Fire Hydrant:
        i. For Fire Hydrants that have not used recently been used, be sure to flush rust out by turning water on for a few seconds with cap off and adapter off.
        ii. Put adapter on hydrant; connect hose to hydrant and truck.
    b. Water pump:
        i. Take precautions to avoid letting sand get into water tank if filling via water pump from pond, lake, river, stream or other natural water source.
        ii. Easiest way to do this is to put a bucket lid below the pump to keep ground sediment from stirring up.
    c. If using any other source, avoid letting debris get into tank.
3. Once hoses are connected and air is drained, open water intake valve.
4. Turn water source on. Wait for tank to fill.
    a. Depending on the filling source, it will take 5-30 minutes to fill entire tank.
5. Once tank is full, shut valve on outside of truck. Turn off water source.
6. Disconnect hoses and adapters.
7. Put away any other equipment used to fill.
8. Close Air Drain valve.
9. Turn Air supply on.

Additional Steps for Cold Weather

1. Once water is disconnected, close second valve on the water intake.
2. Allow water to exit out of lines exposed to cold weather and to prevent freezing.
3. After lines are empty, be sure to close internal fill valve.

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Operating Pressure washer

Turning on Pressure Washer (PW)

1. Ensure all hoses are connected correctly and that gun is connected to end of hose.
2. Ensure Tank is pressurized.
    a. If not pressurized close air drain valve on top of tank.
    b. Open air supply valve on located on wall above truck.
3. Open pressure washer water supply valve.
    a. It is on the hose running from water tank to pressure washer.
4. Turn pressure washer on.
5. Ensure all hoses are still connected and that the gun has pressure to it after turning on.
    a. If a connection was not correct (lose or unlocked) the pressure will cause it to blow apart.
    b. IMMEDIATLEY shut off PW and close valve if this happens.
    c. Check that the O-rings are still located in the fitting that was blown apart by pressure.
    d. Reconnect hoses and try again.
6. Prep structure.
7. If at any time the Pressure Washer is being unused for an extended amount of time, turn it off until it is needed. Leaving the PW on will damage O-rings and seals.

Turning off Pressure Washer

1. Hit the off button or flip switch to OFF.
2. Shut pressure washer water supply valve.
3. Squeeze trigger on gun and relieve pressure from lines.
4. Disconnect PW gun.

In cold WEATHER, follow these additional steps

5. Secure discharge end of hose down in the safe direction so it does not move when air is pushing water through hose.
6. Disconnect PW hose from a pressure washer.
7. Blow water out of PW hose 45-60 seconds to prevent it from freezing.

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Prepping Surface
Safety Precautions:

Wear all necessary PPE and follow all procedures concisely and correctly. Be sure that atmosphere of structure has been monitored and recorded on confined space sheet.

1. Ensure all safety MOT is set up and in proper working order.
2. Employee that is washing is to put on hardhat, wash suit, rubber boots, rubber gloves, eye protection, and harness.
    a. Employee may choose to wear a wash shield, facemask or any other protection that he/she wishes.
    b. Employee must also wear spray helmet with supplied air to wash if atmosphere is at unsafe levels.
3. Lay out pressure washer (PW) hoses, extension cords, PW gun, PW tips, and angle grinder with diamond grinding blade.
4. Grind the inner surface of frame of structure.
5. Place plywood plank over invert.
6. Remove steps now if job requires.
    a. Beat out cast iron steps with hammer.
    b. Remove steel steps with angle grinder and cutting blade.
    c. Remove plastic and fiberglass steps with angle grinder and cutting blade.
7. Pick up all step debris

    ENSURE THAT STEP DEBRIS DOES NOT GO INTO INVERT
8. Turn on PW.
9. Begin washing structure from top to bottom in a horizontal motion.
    a. Keep tip of orbital 12”-18” away from wall when washing.
    b. Wash entire interior surface.
    c. Pay special attention around pipes, under pipes that are located above bench/invert.
    d. If invert is to be lined, plug off line with plug or flow through and use angle grinder with grinding blade or wire brush to score invert area
    e. Wash Invert THOROUGHLY.
    f. Wash down to 2” below water line if invert is not being lined.
10. Remove all debris from bench area and plywood.
11. Top person, rinse top part then lower gun to washer to finish rinse
    g. Ensure surfaces to be lined are thoroughly rinsed.
12. Inspect the hole from within to ensure that entire area to be lined is clear of debris.
13. Exit hole.
14. Shut off PW and drain pressure from hoses.

DO NOT LEAVE PRESSURE WASHER ON FOR AN EXTENDED PERIOD OF TIME WITHOUT USING IT. DAMAGE CAN BE CAUSED TO THE MACHINE IF IT IS LEFT ON WHILE NOT IN USE.

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Manhole Drying Procedures and Tasks

Methods of Structure Drying

There are 3 ways we dry the surface.

1. Heat Wagon Diesel heater
2. Torch and Fan
3. Fan

Heat Wagon Diesel Heater

1. In order to use a Heat Wagon, there must be the ability to put the heater within 15 feet of the hole.
    a. Most heater tubes are 20' so 15' will allow the tube to be dropped in the structure a sufficient amount.
2. Attach the heater tube to heater.
    a. Heater tubes have a metal ring on one end and that metal end has 4 brackets that attach around 4 screws on the end of the heater.
3. Place the heater tube in the hole
    a. At least 2 feet in the hole
    b. Good principle is to have the heater tube 1/3 – ½ the depth of the hole into the hole. i.e. a 9' hole would be 3 - 4 ½' in the hole.

IT MAY BE NECESSARY TO MOVE THE TUBE IN THE STRUCTURE TO ACHIEVE A DRY SURFACE.

4. Plug the heater into a heavy-duty extension cord.
    a. Be sure to use a heavy-duty cord because some of the light duty cords will not carry enough power to effectively power the heater.
5. Flip the switch on the control panel up to the ON position.
    a. Do not switch to the bottom ON position as this position is for a thermostat.
6. Ensure the heater is working and drying the hole.

IF THE HEATER IS NOT WORKING, GO TO THE MANUAL AND TROUBLESHOOTING SECTION TO TRY TO CORRECT THE MALFUNCTION.

Shut Down

1. Turn the power switch to the off position.
2. Leave heater plugged in until fan shuts off.
    a. This will take a few minutes because these heaters have a cool down function before shutoff to avoid damage to the unit.
3. Once fan has stopped running un-plug the heater.
4. Pull the tube out of the hole.
5. Disconnect tube from heater and put it away.
6. Move heater away from the hole to a safe position.

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Torch and Fan

1. Take fan to surface that needs to dried, plug it in and turn it on.
    a. Secure it so it does not fall into the structure.
2. Get the weed burner torch and hand-held torch.
3. Start the hand-held torch and insert into the end of the weed burner.
4. Slowly turn on the propane supply to the weed burner.
5. Put the hand-held torch down and turn the propane to obtain the desired flame on the weed burner.
    a. The flame should blow at a fast pace but not full blast.
6. Place the weed burner in the hole at desired point.
    a. Do not put too close to steps, incoming pipes, drops, or invert/bench area because the direct flame heat could and will damage any of these.
    b. If there is no blower tube in the hole
        i. Insert about ½ the depth of the hole.
    c. If there is a blower tube
        i. Put the flame to be 1 - 2’ below the end of the tube.

Turning off the Fan and Torch

1. Once the hole is dry first turn the propane off at the tank.
2. Pull the weed burner out of the hole and put in a safe place to cool down.

BE CAREFUL BECAUSE THE END OF THE WEED BURNER WILL BE EXTREMELY HOT.

3. Turn off the fan and put it back on the truck where it belongs.

Fan

1. Take fan to surface that needs to be dried, plug it in and turn it on.
    a. Secure it so it does not fall into the structure.
2. Unplug and put the fan away when the surface is dry.

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Duties for Top Person While Structure is Drying

1. Remove any wash equipment still on.
2. Ensure PW hose has pressure drained and put hoses, gun, and tips away.
    a. For cold weather prior to putting hose away, you must remove water.
        i. Take gun and tips and put in warm part of truck
        ii. Ensure hose is pointed in a safe stable direction.
        iii. Disconnect hose directly from PW.
        iv. Blow air through hose for 90 seconds.
        v. Disconnect air and put Hoses away in warm area.
3. Put angle grinder away.
4. Check structure for drying progress ever 10-20 minutes.
5. Inform crew leader if structure has any leaks
    a. Gather any leak stop equipment needed and take to structure.
6. Pull out Hood Air hoses to structure.
7. Put Trashcan by structure.
8. Bend Rebar to an L shape with at least 8” in length on either leg of L.
9. Apply light mist of mold release to face of both stamps.
10. Stage stamps, camera, and tape measure next to structure.
11. Inform Crew leader when hole is dry and prepare pumps and hoses to pull out.
12. Move any items that may be damaged by overspray away from the structure.

NOTE This is not an all-inclusive list.

Duties of Sprayer While Structure is Drying

1. Remove any wash equipment if necessary.
2. Ensure that other crewmember understands and knows how to do his tasks.
3. Enter to desk area of equipment do the following in any order.
    a. Clean spray guns.
    b. Fill out Manhole field report or any other applicable paper work.
    c. Ensure that appropriate pictures have been taken.
4. Put clean shields on spray hood.
5. Check the hole for leaks.
6. Stop leaks if there are any.
    a. Move on to the next step if there are no leaks.
7. Put protective suit on.
8. If the surface is dry
    a. Startup pumps.
    b. Pull out hoses.
9. If the structure is not dry.
    a. Stop leaks and continue to dry.

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Leak Stop

Leak Stop Materials (in addition to the Grouts previously covered)

Hydraulic Cement – Hydro
This cement uses water to harden. There are many different brands on the market. The brand commonly used is Speed Plug.

Xypex
This is specially formulated, chemically enhanced version of hydro. The chemical in this hydro helps it to cure to the host substrate more than normal hydro.

OBIC 2306 Oakum
Oakum is a strong fibrous jute material free of oils and tars. It looks like loosely wound rope. It is used to stop leaks by using a screwdriver and jamming into holes and leaks.

Leak Stop Methods/Procedures

Leak stopping

Leak stopping is one of the most valuable skills to be learned; it is also one of the most difficult to master. There are many different methods used to stop leaks.

PPE is of high importance when working with leak stop chemicals. Many of these chemicals are extremely reactive with moisture, which would include moisture found in the human body. When around or handling leak stop chemicals, proper PPE MUST BE used.

If this is a precast manhole, the most common 'leak stop' technique is to stop all leaks and dry before starting to line structure. Since the precast structure is made of large solid pieces, leaks should not be able to move around the hole. The areas most susceptible to leaks are the joints and the lift holes. Precast manholes are assembled in sections as provided by the concrete company. The joints where the sections are put together are a likely place for a leak to develop.

In a brick manhole, attempting to stop the leak first could make the leak move to another location and end up wasting time and materials chasing it around. For one semi-contained leak, approach the leak by stopping the leak before lining. If the leak begins moving, then revert to the method of lining the non-leaking areas with the first two layers and then stop leaks in the final area. It is important to always be aware of the details of the leaks. Always consider different methods if the one you are using is ineffective.

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Most common 'leak stop' methods:

'Leak stop first' method.

This is the most commonly used method.

1. Stop Leaks
2. Line structure

'Line first' method.

Best used in brick/ block manhole that has significant dry areas above leaks.

1. Spray Polyurea and foam all the way down the leaking area
2. Stop the leak using hydro or grout.
3. Reprep areas with debris
4. Re-dry wet areas
5. Finish lining hole

NOTE

Stop spraying well short of the wet area when using this method. If the wet area is sprayed, it could cause adhesion problems.

'Drain' method

This method may be useful if the hydrostatic water pressure behind the wall is making the leak stopping attempts fail.

1. Drill 3/8" drain holes roughly 12"-18" below the leaking area, angle upward toward the leaks.
2. Choose one of the following approaches.
    a. Put ¼ NPT nipple in drilled hole.
        i. Line down to hole
        ii. Put cap on end of nipple
        iii. Dry area and line
    b. Spray non-leaking areas and then re-attempt leak stop.
    c. Re-attempt leak stop, especially with hydro, in the leaking area.
    d. Leave the structure and let the drilled holes drain some of the hydrostatic pressure over the next few days.

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Leak Stop at Joints

HyperSeal is a great choice for this method.

1. Drill 2-4 3/8” diameter holes approximately 1” to 3” above or below the joint at a 45-degree angle. Continue drilling holes until water flows from the holes.
    a. There is a joint space 2”-3” into the concrete. Stop when you get to this area.
    b. Drill at least two holes.
        i. Holes should be equally spaced around the hole.
2. Stop the leaks at the joint
    a. Apply wet hydraulic cement into the cracks in the joint
    b. Roll up the Oakum and press into the cracks of the joint
3. Inject grout into one of the drilled holes until it starts to flow out of the other hole(s).
4. Insert ½” wooden plug into the first hole.
5. Repeat process in all drilled holes.
6. Apply pressure with rags or paper towels to any areas where the grout flows out of cracks until the grout sets up.
7. Apply wet hydraulic cement to any remaining weeping leaks.

Leak Stop in a crack

There are multiple ways to stop a leak at a crack.

1. Drill hole at bottom of crack
    a. Used hydro to cover crack from the hole at one end all the way to the other end.
    b. Inject grout in the drilled hole until it comes from the opposite side of the crack.
    c. Seal off entire crack after grout has set up
2. Drill hole to side of crack, angularly so as to intersect the crack. Stop drilling when you intersect the crack.
    a. Inject grout in the drilled hole until it comes out of the crack.
    b. Continue this process until the leak is stopped.
3. Fill hole with grout-infused oakum.
    a. If necessary, take a chisel and widen hole to fit oakum all the way inside.
4. Stop leak with Hydro

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Using Hydro to stop a leak

When using Hydro there are two methods: Dry Hydro and Mixed Hydro. The type of leak will dictate whether to use *dry* or *wet* hydro.

Dry Hydro-

If the leak is small, you can use dry hydro.

1. Wear appropriate PPE.
2. Obtain a small amount of dry hydro in hand.
3. Press the the hydro over the leaking area with hand.
4. Apply firm pressure for 20-30 seconds.
5. If the leak has not stopped, try this method 1 or 2 more times.
6. If the leak does not stop after this, move to a different method.

NOTE

When dry Hydro is used to stop leaks, after leak is stopped, the dry hydro must be wetted with wet rag, brush, or bucket of water because coating products will not stick to the dry Hydro. This is not the preferred method for using hydro.

Wet/Mixed Hydro

If you have a leak with more than just a little pressure or a leak that covers a large area you should use wet Hydro.

1. Wear appropriate PPE.
2. Get a bucket with 1”-3” of water, depending on how much hydro is needed.
3. Then mix the hydro to a desired thickness.
    a. This will vary depending on the temperature and the type of leak being attacked.
    b. Generally, the texture of soft serve ice cream is the easiest and most effective thickness to work with.
4. When the hydro is mixed and ready to use, make a ball of hydro and then push it onto the leaking area and
    a. Apply pressure for 20-30 seconds to stop the leak.
5. The pressure will hold the leak back and help to set the hydro in the place that you want it.

NOTES

If there is more than 1” thick of hydro and the leak continues to push through it is time to consider using a different technique. When mixing hydro, it is important to be conscientious of the temperature and the amount of hydro added to the water. If it is hot outside, it may need to be mixed to a cake batter consistency because it will react very quickly. During colder months, it may need to be mixed to a playdoh consistency because the cold weather and cold water will severely slow the reaction time of the hydro. If the hydro is not mixed to the correct consistency, it could make the hydro ineffective at stopping leaks.

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Hand Pump Injected Grouts

For leaks that need grout the first choice is often Hand pump injected grouts. These grouts are injected through either a single tube caulk gun or a dual tube gun. When using these grouts, it is important to pay attention to the details of how and where it is being injected and what affect is taking place, different grouts work best in different situations. At times leak stopping with grout can be more of an art than a science. If the leak has slowed significantly, then use hydro or another type of grout to finish stopping the leak.

When the leak is stopped, the area must be cleaned, it can be removed with a scraper, but sometimes a rewash of the area might be needed. Never line over chunks of grout in the structure. Be sure not to let any grout, activated or not activated, wash down the outgoing pipe. Grout can cause problems with sewer pumps and or problems at sewer processing plants.

*Using **HyperSeal** to stop a leak*

1. Drill a 3/8" hole
    a. drill the hole 1-3" below the leak.
2. Pump a tube of grout into the hole.
3. Close hole with a ½" wooden plug.
4. Use paper towels or rags and apply pressure to area to try to keep grout from flowing out of wall if the grout finds a way to push out into the structure.

*Using **FastSeal** to stop a leak*

For larger leaks, either larger area or larger water volume, one of the most effective methods is to use FastSeal. FastSeal is a two-part, hydrophobic, polyurethane injection material. It produces a rigid, closed-cell foam. It is use as an effective stabilizer in void-filling and water-bearing soils. It is a very fast setting foam. FastSeal can be used in all types of structures (brick, block, precast or poured concrete). The deciding factor of using Fast Foam is the size of the leak.

1. Drill a 5/8" hole at a point around the leak angling toward the area behind the leak, in the area of where the leak appears to be starting.
2. Put oakum in any of the leak areas where it appears the pressure may just push out the grout.
3. inject the grout into the hole
    a. Shake grout
    b. Put on the mixing tube
    c. Put it in the dual cartridge injector.
4. If the leak has not stopped and still has a large volume coming through you may need to drill a new hole and try this process again.

NOTE

Use the entire cartridge, these cartridges are not reusable.

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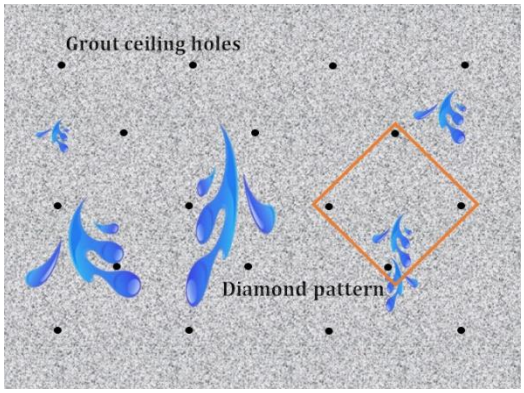
Mechanically Pumped Grouts

These grouts are injected in the wall through zerks. A zerk is a type of fitting or nipple that the grout is applied through. An alternative method is to inject with a pipe pushed directly into a drilled hole. If there are a high number of leaks, the best approach is to start by drilling all holes you believe necessary.

Curtain grouting technique

1. Drill holes to set a grout ceiling .
    a. 4-6" above the highest known leaks.
    b. 12-18" apart from each other.
    c. 4-8 holes depending on the size of structure.
2. Drill holes down 12-18" and to the side 6"-12".
3. Do the same thing from that hole creating a diamond pattern in the structure.



4. Continue doing this all the way down to the area below the leaks.
    a. If this goes all the way down to the bench then drill holes in the corner of where the wall meets the bench perpendicular to the wall.
        i. Space holes 12-18" apart.
5. Create grout ceiling.
6. Hammer zerks into every other hole on the very top layer.
    a. Injecting grout into these zerks for 10-30 seconds or until there is grout coming out from anywhere .
    b. Put the other half of the zerks in the top layer and do the same thing.

NOTE

This acts to stop the leaks from moving up further when you begin to inject grout lower.

7. Go to the very bottom level and put zerks in all holes on that level.
8. Then inject grout the same way.
    a. Watch the holes above injecting area, looking for evidence that the grout is working.
    b. Move up one level, put zerks in and repeat process.

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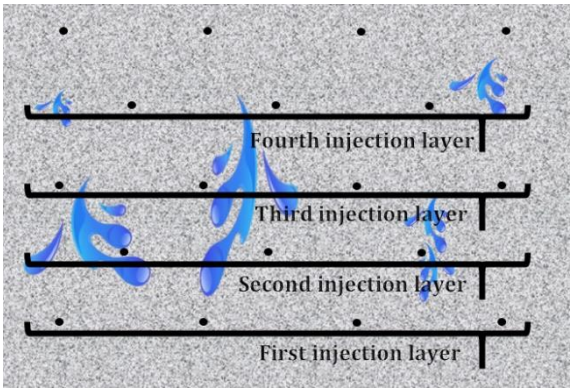
c. Put pressure behind grout gun to get a good seal on the zerk.
d. Keep repeating this process all the way to the top level.

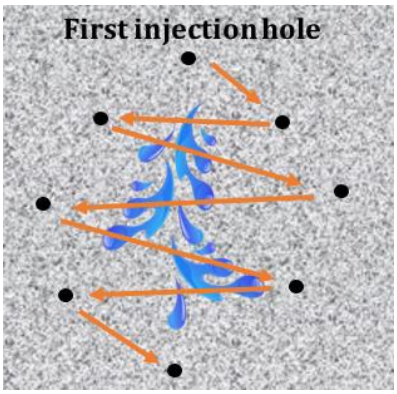


Pay attention to not miss any holes and to look for areas that may need more grout. If there a hole that is doing exactly what is wanted then keep going back to it to get it to keep moving around the hole in the desired fashion.

Spot curtain

Use this approach if there is a high number of leaks, but not throughout the entire structure.

1. Drill holes all the way around the leaking area keeping holes 12-18" apart from each other and 3-6" away from leak.
    a. If the leak area is big enough, it may necessary to drill holes into the middle of the leak as well keeping holes spaced, approximately 12" apart. Begin grouting at the 12 o'clock position work towards the bottom alternating from one side to the other.



    b. This is to make the grout form an outside barrier around the leak and to contain it.
2. Then if there are holes drilled inside, work from the bottom up.
3. Check the effectiveness of your work.

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4. If there are areas still leaking, pump more grout into this area through the zerks located in that area. If the grout has set up in the zerks drill more holes in close proximity to the leak and pump grout there.
5. Open valve on zerk gun for 5 seconds, Close the valve to build line pressure and then turn on again.
    a. Continue repeating for 10-30 seconds per zerk.

Using OBIC 2090 MultiSeal to stop a leak

MultiSeal is a one-part water reactive grout. It is a single component; moisture activated polyurethane injection resin. Designed for sealing active water leaks in cracks or joints in concrete structures. There is no catalyst for this grout.

This grout is best suited for structures with a large area of leaks that are weepers or slow leakers. It is slow reacting, taking about 90 seconds to react depending on temperature of the ground, the grout and the moisture content in the ground**.**

Using OBIC 2060 MaxSeal to stop a leak

MaxSeal is injected as a single component, moisture activated, MDI-based polyurethane resin. The chemical reaction of this product is catalysed by using OBIC 2060C MaxSeal conditioner and uses moisture as an initiator. MaxSeal was designed to bind together and waterproof loose granular soils. MaxSeal withstands wet/dry cycles, permeates well, and reacts quickly with water to form a dense, impermeable semi-rigid foam. 2060C should be added at rate of ½ - 2 each 32oz containers per jerrican of MaxSeal. Reaction time will be anywhere from about 45 seconds to 120 seconds depending on how much 2060C you add, and the temperature and moisture of the soil you are grouting. The more added the quicker the reaction time.

Using OBIC 2020 UltraSeal to stop a leak

This grout is for large high-volume leaks, or leaks coming from areas where there is a known large void. Injected as a single component, catalysed OBIC 2020C UltraSeal conditioner is a moisture activated MDI-based polyurethane resin. The chemical reaction of this product is catalysed by using 2020C and uses moisture as an initiator. UltraSeal was designed with soil permeation in mind – low viscosity for penetration with very high expansion to fill voids, stop active or potential water leaks, and stabilize soils. UltraSeal withstands wet/dry cycles, permeates well, and reacts with water to form a dense, closed-cell, impermeable semi-rigid foam. UltraSeal has a very fast reaction time at quickest is a 4 - 5 second reaction and at slowest is about 15 seconds. Depending on how much 2020C is added and the temperature of the soil that is being grouted, add one to two 72 oz. container of 2020C to every can of UltraSeal.

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Cleaning the Grout Pump

Whenever a grout pump is used, it must be cleaned out as soon as possible to eliminate the possibility of damage. The pump needs to be cleaned as soon as possible or when it will not be used for more than 1 hour. If it is not done promptly, the grout can set up in the pump or hose and render those pieces of equipment worthless.

For the cleaning process, a cleaning solution and a pump storage solution will both be needed to flush through the pump. OBIC Flush can be used for both of these because it is an oily solvent that will clean without damaging the pump or its packings. Acetone or Xylene can also be used as cleaning solutions. Vegetable, corn, or hydraulic oil can be used as the storage solution. Be forewarned that these oils have a very low moisture content but they can still contain moisture that can make residual grout react.

1. Check and ensure pump is off.
2. Fill one bucket with at least 1 gallon of cleaning solution, and 1 bucket with at least 1 gallon of storage solution.
3. Take the suction tube out of the grout slowly. Allowing for any residual grout on the tube to drip back into the grout container.
4. Put the suction tube in the bucket of cleaning solution.
5. Take the recirculation (prime) tube out of the grout and hold over the grout container. Allow any residual grout to drip into the grout container.
6. Put the recirculation tube in a trash bucket.
7. Turn the pump on.
    a. Turn the knob from pump to prime.
8. Once there is acetone coming from the recirculation tube, turn the pump off.
    a. Place the recirculation tube in the cleaning solution.
    b. Turn the pump back on.
    c. Let the cleaning solution circulate for 10 - 15 seconds.
9. Turn the knob from prime back to pump. The pump should stop.
    a. If the pump does not stop, ensure that the valve is closed.
10. Take a paper towel and using cleaning solution wipe off the outside of each of the tubes.
11. Point the end of the hose into the grout container.
    a. Open valve for 10 seconds.
    b. Close valve.
12. Point end of hose into trash bucket.
    a. Open valve and keep open until there are cleaning solution coming out the end.
    b. Ensure that acetone bucket does not go empty.
    c. Close valve.
13. Point valve in the cleaning solution bucket.
    a. Turn the pressure all the way up on the pump.

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   b. Slowly open valve allowing cleaning solution to go into bucket.
   c. Leave open for 3-5 seconds.
   d. Close valve for 3-5 seconds letting pressure build in lines.
   e. Repeat steps, 3-5 times.
14. Turn pump off.
   a. Take the suction tube out of the acetone, put it in the bucket of storage solution.
   b. Take the recirculation (prime) tube out of the cleaning solution and place in trash bucket.
15. Turn the pump on.
   a. Turn the knob from pump to prime.
   b. Once there is storage solution coming from the recirculation tube, turn the pump off.
   c. Place the recirculation tube in the storage solution.
16. Turn the pump back on.
   a. Let the storage solution circulate for 10-5 seconds.
   b. Turn the knob from prime back to pump. The pump should stop.
   c. If the pump does not stop, ensure that the valve is closed.
17. Point the end of the hose into the cleaning solution bucket.
   a. Open valve for 10 seconds.
   b. Close valve.
18. Point end of hose into trash bucket.
   a. Open valve and keep open until there are storage solution coming out the end.
      i. Ensure that vegetable oil bucket does not go empty.
   b. Close valve.
19. Point valve in the storage solution bucket.
   a. Turn the pressure all the way up on the pump.
   b. Slowly open valve allowing storage solution to go into bucket.
   c. Leave open for 3-5 seconds
   d. Close valve for 3-5 seconds letting pressure build in lines.
   e. Repeat steps 3-5 times.
20. Turn pump off.
21. Relieve pressure in the lines into storage solution.
22. Take the tubes out of the storage solution.
23. Take rubber glove and put ends of both tubes inside the glove.
   a. Secure the glove with tape or a tie to ensure it does not fall off.
24. Wrap up all of the cords and hoses used for the grout pump.
25. Keep any useable cleaning solution and storage solution.

This whole process should take no more than 5 minutes. The acetone needs to get in and out of the pump as quickly as possible. Acetone can damage the internal seals if left too long.

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Primer

The size, condition, material and shape are some of the details that determine if and what kind of primer is to be used. OBIC has 4 different primers and 1 prep product. Each product is unique in its own way and has a certain way that it needs to be applied.

OBIC 1500 C

OBIC 1500 Concrete Primer is a fast curing modified polymer primer that is formulated for deep penetration into concrete surfaces. The low viscosity OBIC prime 1500 CP is specifically formulated for excellent adhesion to OBIC system polyurea. This two-component polymer primer has superior wetting of substrate. OBIC prime 1500 CP may be applied by brush, roller, squeegee, paint sprayer, or airless sprayer. Coverage rates will vary depending on porosity of concrete. Apply at 5-10 wet mils, which will cover approximately 200-260 square feet per gallon. Finished result of applied primer shall resemble a satin/sealed surface.

This product has a pot life of 45 minutes and a cure time of minimum 4 hours. The best way to determine if the primer is done curing is with the glove test. Put a glove on, place that glove flat against the wall, and if no wet material comes off on the glove then the primer is dry. Once applied the recoat window for this material is 48 hours.

1. Ensure substrate is properly prepped and dry.
2. Mix 1-part A with 1-part B in mixing container.
    a. Can be thinned with 1-part acetone.
3. Choose application method.
    a. Brush/ Roller
        i. Wet brush/roller
        ii. Lightly apply primer to surface.
            1. Should be just enough to make surface appear wet.
    b. Sprayer
        i. Fill supply tube or canister with mixed primer.
        ii. Apply thin layer of primer to surface.
            1. Just enough to make surface appear wet.
4. Allow to dry.
5. Recoat within 48 hours to stay within recoat window.

OBIC 1500 CPF

OBIC 1500 CPF is a fast curing modified polymer primer, which is formulated for deep penetration into concrete surfaces. The low viscosity OBIC prime 1500 CPF is specifically formulated for excellent adhesion to OBIC system polyurea. This two-component polymer primer has superior wetting of substrate. OBIC prime 1500 CPF may be applied by brush, roller, squeegee, paint sprayer, or airless sprayer. Coverage rates will vary depending on porosity of concrete. Apply at 5-10 wet mills, which will cover approximately 200-260 square feet per gallon. Finished result of

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applied primer shall resemble a satin/sealed surface. Due to the decrease pot life, it is recommended to cut this product with acetone and to apply it with an airless sprayer.

The main difference between CP and CPF is the pot life and cure time. This product has a pot life of 15 minutes and a cure time of minimum 30 min. The best way to determine if the primer is done curing is with the glove test. Put a glove on, place that glove flat against the wall, and if no wet material comes off on the glove then the primer is dry. Once applied the recoat window for this material is 24 hours.

1. Ensure substrate is properly prepped and dry.
2. Mix 1-part A with 1-part B in mixing container.
    a. Can be thinned with 1-part acetone.
3. Choose application method
    a. Sprayer:
        i. Fill supply tube or canister with mixed primer.
        ii. Apply thin layer of primer to surface.
            1. Just enough to make surface appear wet.
    b. Brush/ Roller (Not recommended approach):
        i. Wet brush/roller
        ii. Lightly apply primer to surface.
            1. Should be just enough to make surface appear wet.
4. Allow to dry.
5. Recoat within 24 hours to stay within recoat window.

OBIC 1503 S

OBIC Prime 1503 S Steel Primer is a fast curing modified urethane primer that is formulated for excellent cure profile. OBIC prime 1503 S is specifically formulated for excellent adhesion to OBIC system Polyurea and Polyurethanes. Excellent adhesion to properly prepared steel substrates for long service life in harsh conditions. OBIC Prime 1503 S adheres strongly to steel. It should be mixed 1-part A to 2-part B and does not require thinners. Mixing should be performed at low speed mechanically or by stir stick manually for at least 1 minute.

This product has a pot life of 5-120 minutes and a cure time of minimum 5 min. Apply at 5-1.5 wet mils. The best way to determine if the primer is done curing is with the glove test. Put a glove on, place that glove flat against the wall, and if no wet material comes off on the glove then the primer is dry. Once applied the recoat window for this material is 24 hours.

1. Ensure substrate is properly prepped and dry.
2. Mix 1-part A with 2 parts B in mixing container.
    a. Mix with stir stick for at least 1 minute.
3. Choose application method:
    a. Brush/ Roller
        i. Wet brush/roller

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ii. Lightly apply primer to surface.
    1. This primer has a white color so the surface should appear to have a translucent white layer on it.

b. Sprayer
    i. Fill supply tube or canister with mixed primer.
    ii. Apply thin layer of primer to surface.
        1. Just enough to make surface appear wet.

4. Allow to dry.
5. Recoat within 2 hours to stay within recoat window.

OBIC 1505PW

OBIC 1505 PW is a fast curing modified polymer primer that is formulated for deep penetration into concrete surfaces. The low viscosity OBIC prime 1505 PW is specifically formulated for excellent adhesion to OBIC system polyurea. This two-component polymer primer has superior wetting of substrate. OBIC 1505 PW adheres extremely well to properly prepared concrete. It can be either hand mixed, applied through low pressure plural component cartridge spray and a static mixing wand, or sprayed through a low pressure proportioner, such as a Graco E10 with a static mix gun (Fusion Solvent Purge, Binks 43P or similar). Apply at 3-6 wet mils. Coverage rates will vary depending on porosity of concrete. Finished result of applied primer shall resemble a satin/sealed surface.

This product has a pot life of 3 minutes and a cure time of minimum 20 min. The best way to determine if the primer is done curing is with the glove test. Put a glove on, place that glove flat against the wall, and if no wet material comes off on the glove then the primer is dry. Once applied the recoat window for this material is 24 hours.

Application procedure will vary depending upon equipment used.

1. Ensure surface is properly prepped and dry.
2. Apply thin layer of primer.
3. Allow to cure.
4. Recoat within 24 hours to stay within recoat window.

OBIC 1600

OBIC 1600 is a single component surface preparation solution for promoting inter-coat adhesion between successive applications of spray polyurea and polyurethane coatings. It can be applied to plastic and fiberglass surfaces as well to help with adhesion. OBIC 1600 does not require a thinner and can be applied using a cup gun, brush, clean rag or roller. The substrate should be free of oils, dust, dirt or other contaminants.

1. Apply OBIC 1600 in a thin film that thoroughly wets out the substrate surface.
2. Apply an elastomeric recoat only after OBIC 1600 is completely dry.
3. Apply coating within 4 hours to stay within recoat window.

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Lining the Manhole

Starting up Pumps

Pumps should already be powered on with the hose heats on. This should be done when trucks are started at the beginning of the day.

Pump Start up Procedures

1. Ensure that pump has adequately supplied material.
    a. Pressurized tanks- make sure there is pressure.
    b. Other tanks- Make sure transfer pumps are working and supplied by power source.
    c. Drums- Make sure stick pumps are working and supplied air.
2. Ensure hose heat is up to temperature
3. Turn on A & R heats and open valves.
4. Allow A & R heats to come up to temperature.
    a. Polyurea ≈ 160^{o}
    b. Foam ≈ 130^{o}
5. Turn MOTOR POWER on and motor to PUMP.
6. Ensure static pressures are within 200 psi.
    a. Polyurea 2300-2500 psi
    b. Foam 1100-1300 psi
7. Pull out hoses and start lining structure.

Pump Shut Down

1. Turn motor to RETRACT.
2. Spray pressure off gun to ≈750 psi
3. Turn MOTOR POWER OFF.
    a. PUMP TO NEUTRAL (knob straight up and down).
    b. Shut valves.
    c. A & R heaters OFF

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Pulling out hoses/ putting hoses away

Pulling out Hoses

<u>This is a two-person job.</u>

1. Person 1 will grasp the end of line as well as the gun and begin walking away from the truck
2. Person 2 begins taking loops off the reel, 1 loop at a time, and put it outside of the truck.
3. As person 1 is walking away from the truck with the hose, ensure that the gun is being twisted to rotate the hose to get all of the loops out of the hose.
    - If special care is not taken to remove loops from the line, it could sustain damage and make it more susceptible to failure in the future.

<u>NOTE IMPORTANT THINGS TO REMEMBER WHEN PULLING OUT HOSES</u>

- Do not drag the gun on the ground.
- Always remove loops from hose as it is being pulled.
- Keep hoses out of water as much as possible when pulling out hoses
- Keep hose out of water all together when it pulled out.
- Never allow loops to have a radius of less than 3 feet.
- Smaller radius loops can damage hose.

Putting hoses away

1. Person 1 grasp the end of line as well as the gun.
2. Person 2 should place loops on the reel, while twisting the hose to ensure it properly wraps around the reel, and putting it to the back of the reel working forward.
3. Person 1 must twist the gun and hoses to make sure the hose does not kink due to the person in the truck twisting the hoses while putting them on the reel.

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Coating procedures

Standard Manhole lining

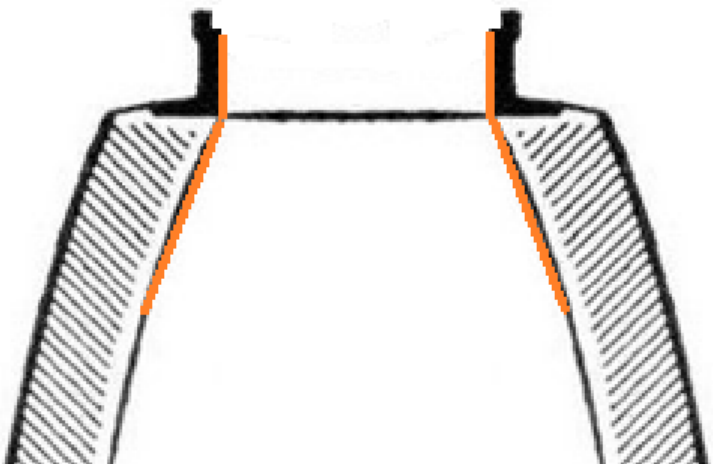
This procedure will outline the normal lining process for a basic problem free manhole that is receiving the 3-layer OBIC Armor Product. For every manhole, there are multiple considerations that may alter the order in which the lining process happens. i.e.:

- Invert needs lined
- Pipe extension needs put in place
- Drops that need blocked off
- Leaks

These are only a few variations that may happen. Every manhole has its own characteristics so approach each one individually and solve problems as they arise. Starting at the top is the best.

Ensure that all PPE is on at this point.

1. Take Polyurea gun
    a. Place arm into the manhole and with the gun 12”-18” away from surface to be coated get ready to spray. *See Illustration.*
    b. Keep gun perpendicular to the surface that is being coated. In round structures, this most often means that a lot of wrist to rotate the gun.
2. Start rotating wrist and squeeze the trigger, making material spray.
    a. Rotate at a speed that the material is coating 1’-2’ feet per second.
3. Release the trigger before stopping the rotation of gun.
    a. Ensure that gun stays 12”-18” away from surface. If it gets too close, the material will splatter and get too thick.



4. Put a layer of Polyurea that is approximately 50 mils (1.25mm) thick.
    a. This will be just thick enough to not see through.

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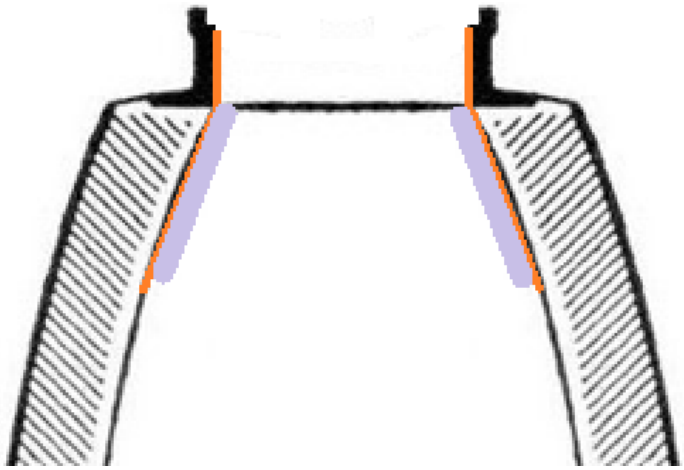
b. Coat from the bottom of the lip of the casting all the way down to the lowest reachable area. *See Illustration.*



5. Lock the gun and hand it to the top person.
6. Get the Foam gun.
    a. Put arm into the manhole and with the gun 18”-24” away from surface to be coated get ready to spray.
    b. Keep gun perpendicular to the surface that is being coated.
7. Start rotating wrist and squeeze the trigger, making material spray. Rotate as a speed that the material is coating 2’-3’ feet per second. This is about twice as fast as with Polyurea.
8. Release the trigger before stopping the rotation of gun.
    a. Ensure that gun stays 18”-24” away from surface. If it gets too close, the foam will splatter set up in the wrong spot.
9. Coat with a layer of foam that is approximately 400 mils (1cm) thick.
   Coat from the bottom of the casting all the way down to the lowest accurately reachable area with your gun from above. This will leave 4-6 inches of only polyurea at the top of the casting.

NOTE

Ensure full control of the angle of the gun is maintained while spraying foam. Foam grows towards the gun. If it is sprayed at a downward angle, it will grow upward, potentially leaving gaps on the bottom side. This makes the foam much harder to spray than then polyurea. If appropriate spray techniques are not followed when applying foam, the final layer of polyurea will be extremely difficult to apply.

1. Once both layers have been applied from the top it is now time get into the hole.
    a. Ensure all necessary PPE is worn, get connected and enter hole.
2. Get situated and ready to spray.

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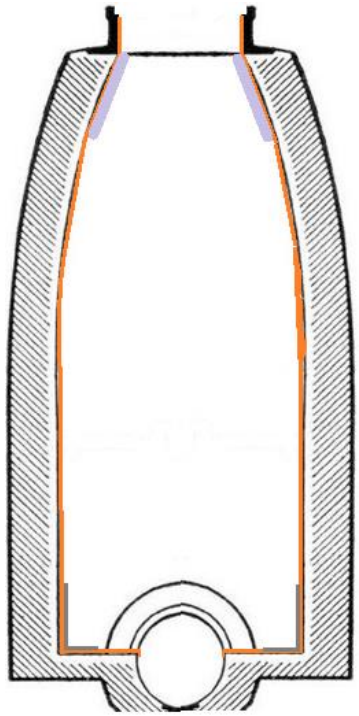
a. The depth of the hole will determine exactly what order the hole is sprayed. If it is a deep hole, (over 15') a technique of doing all three layers in a section then moving down and repeating may be chosen. For these procedure instructions, assume the hole is less than 15' deep.

3. Once at the bottom stand on one side of the manhole and call for the polyurea gun
4. Start from the bench and work up the wall.
    a. Again, keep the gun 12"-18" inches from the surface being sprayed. When spraying the bench, hold the gun perpendicular to the bench and make it so the edge of the fan is lined up with the edge of the bench/invert and move the material at a pace that the material runs over the side by ¼"- ½".
5. Then finish lining the bench. The bench area is very important. Ensure there is a minimum of 50 mils of material put down.
6. Start working up the wall.
    a. It helps to turn the gun upside down and coat the bottom 2' holding the gun that way.
7. Go all the way up the wall as high as can be accurately spray. If this is not all the way to the polyurea applied from the top a ladder to may be needed to get higher.
8. Do the exact same thing for the other side of the bench.
9. Call for 4 pieces of rebar.
    a. This rebar should be bent at a 90-degree angle
10. Place the rebar with one side flat on the bench and the other side running up the wall. There will be 2 on each bench, 6-10" away from the incoming and outgoing pipes. *See Illustration. * Apply polyurea over the rebar, fully coating it, to hold it in place.



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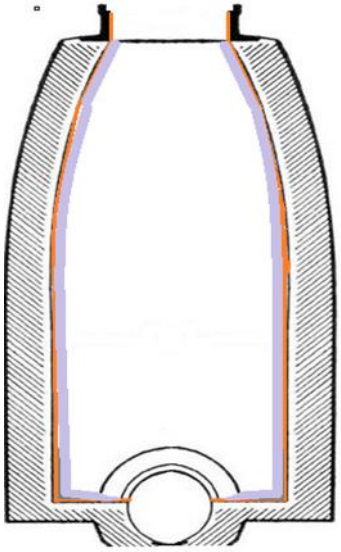
11. Send the Polyurea gun up and have the Foam gun sent down.
12. Start on the bottom of the wall with the gun upside down and spray the bottom 2'
13. Move to spraying the bench.
    a. Leave a gap of at least 3-4" around the edge of the polyurea so that the 3rd layer has a good bond with the 1st layer.
    b. Once the bench and the bottom of the wall are done, a good technique is to turn the gun sideways and make quick shots of foam into the corner of where the bench meets the wall.
    c. Smooth out this area.
14. Work all the way up that wall.
    a. Go all the way up to the foam that was applied from above.
        i. Again, use the ladder if necessary.
15. Do the other side the same way. *See Illustration.*



16. Send the foam gun up and call for the polyurea gun.
17. For the final layer of polyurea start from the top of the hole and work your way down. Start at the highest reachable and work down. *See Illustration 17a on next page*
    a. Apply a minimum of 50 mil thick layer of polyurea.
    b. Ensure that all of the foam is fully covered with polyurea.
    c. Coat the entire structure.
    d. Send the gun up and exit the hole.

18. Take the polyurea gun and apply the top layer of Polyurea to the top portion of the structure. *See Illustration 17b on next page*

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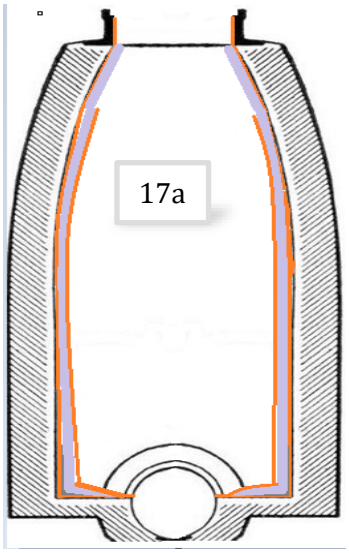

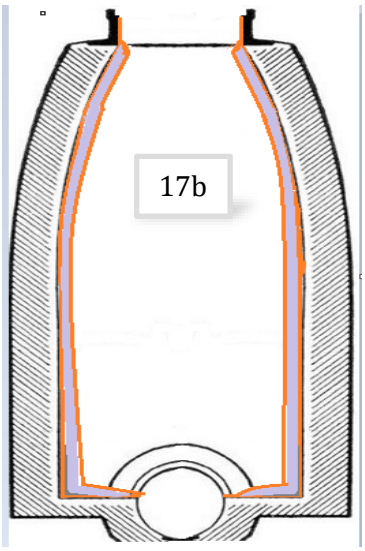

19. Spray a flat area with 2-3 seconds worth of material and put stamps on the area.
    a. Two stamps will be put on every structure.
        i. A date stamp and an OBIC name stamp.
20. Do a quality check of the hole for any missed areas.

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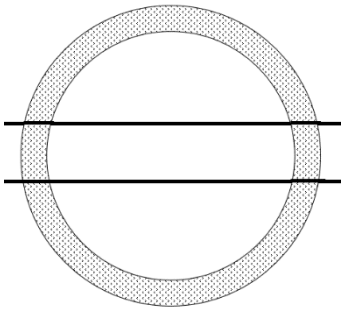
Invert lining

One special consideration when lining manholes is whether the invert is going to be lined.

If the invert is going to be lined, the sprayer will have to make a decision on the best time to spray the invert. If everything is going smoothly one of the best methods is to spray the invert as soon as the hole is entered after lining top area. If there are leak problems, either on the walls or in the invert, the invert might need to be done before anything else or after everything else. No matter which process is chosen, the steps remain the same.

Some things to keep in mind when lining an invert

- Ensure that the invert was cleaned to the highest standard possible.
- Consider using an angle grinder and etching the surface of the invert.
    - This will give the invert profile and the polyurea something to grab on to.
    - When spraying to a PVC or other type of plastic pipe warm that pipe up with Map gas torch before spraying.
        - This opens up the molecules and allows for the polyurea to create a chemical bond with the plastic.



Before starting, decide how to bypass the liquid in the invert. In some cases, the flow is so low that the line can simply be plugged off when it is being lined. In other cases, a bypass may need to be set up or a flow though plug put in place. Once starting to line the invert, the process cannot stop until completion, without compromising whatever work is already done.

Consider placing rebar somewhere in the invert. This may be bent rebar down the edge of the invert and bench.

1. Make sure invert is completely dry and clear of debris.
2. Start on the incoming pipe and with the Polyurea gun
    a. Apply coating over the edge of where the pipe meets the invert.
    b. The polyurea needs to go ½" -1" onto the pipe.
3. Spray at least 3-6" up onto the bench when spraying the invert. Spray the invert with a layer at least 100 mils (2.5mm) thick.

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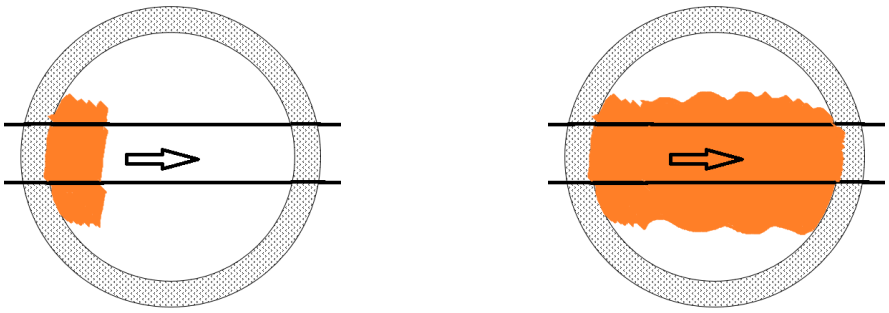
a. This thickness is required because building rigidity in this area is important and since 3 layers are not used, the only way to do this is with a thick layer. Do not try to achieve this thickness in one pass. It will take multiple passes.

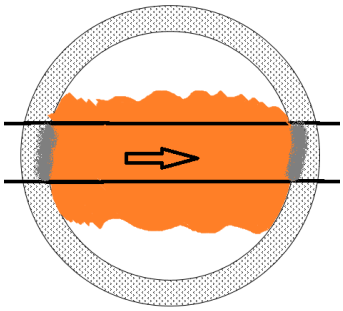
4. Continue spraying and working toward the outgoing pipe. *See Illustration*



NOTE

Spray from incoming to outgoing to create as smooth of a transition as possible. This also creates a building block type structure to the applied liner.
Make sure the polyurea is going at least 3-6" on to the bench, so that the liner applied to then bench has enough area to bond directly to the applied polyurea.

5. Lining can be done in sections due to leaks or other concerns that the hole presents.
6. Put Xypex over each end of the liner system. *See Illustration*



a. Have a loose mixture of Xypex made and lay it down over the seam of where the polyurea ends on the pipe.
b. The purpose of this is to make a smooth transition so anything flowing down the invert does not catch a lip or edge.
c. Put as much Xypex down as needed to ensure that the edges are smooth. You may need to smooth this out with water and a gloved hand after it has begun to set in place.

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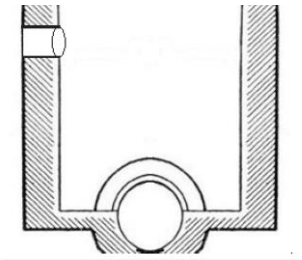
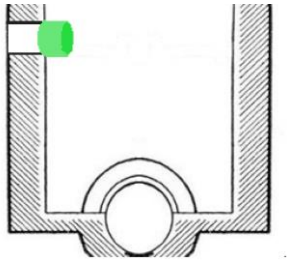
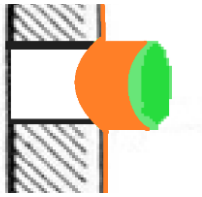
Pipe extensions

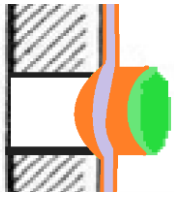
Another special consideration is a pipe extension. *See Illustration* A pipe extension is simply just a section of pipe attached to a wall around a pipe that does not protrude from the wall. These pipe extensions are put in because the extension gets the waste flowing from that pipe separated from the wall further. This helps to maintain and protect the integrity of the liner system.





1. Make sure area around incoming pipe is completely dry.
2. Ensure that the pipe extension is the correct size,
    a. It should be at least the same size as the pipe in the wall and up to 1” bigger than that pipe.
3. Hold the pipe extension to the wall.
    a. Ensure that the pipe is as centered as possible.
4. Spray polyurea on the outside edge of the wall and pipe extension. Spray the polyurea all the way around so that the pipe stays in place without being held there by hand. *See Illustration. When spraying the foam, spray the foam all the way to the extension but do not build up on the extension.
    a. The foam should support the extension but not cover the extension.





5. On the final layer of polyurea, cover the foam area as you would the rest of the hole. Ensure that you have 1st layer polyurea touching the 3rd layer to create a strong bond.
6. Finish the hole.
7. Take hydro or Xypex and smooth the transition of old pipe to extension inside of the pipe extension.

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Duties of Top Person while structure is being lined

1. Spray off Polyurea gun into trash can to clear out cold material
    a. When spraying pay attention to material and spray pattern to ensure gun and material are working correctly.
    b. Give Polyurea gun to Sprayer.
    c. When Sprayer is done with Polyurea from above take Polyurea gun and ensure it is locked in the off position.
2. Ensure picture of Polyurea layer is taken.
3. Spray off Foam gun into trash can to clear out cold material.
    a. When spraying pay attention to material and spray pattern to ensure gun and material are working correctly.
    b. Give Foam gun to Sprayer. When sprayer is done spraying Foam from above take foam gun and ensure it is locked in the off position.
4. Ensure picture of Foam Layer is taken.
5. Give Spray hood connected to airline to sprayer.
    a. Put ladder in structure if necessary.
    b. Connect Sprayer's harness to fall restraint. If winching is required, connect Sprayer's harness to winch. Lower Sprayer into hole.
6. Spray off Polyurea gun into trash can to clear out cold material.
    a. When spraying pay attention to material and spray pattern to ensure gun and material are working correctly.
7. Lower Polyurea gun as Sprayer requests.
    a. Lower rebar while first layer of Polyurea is being applied, when sprayer asks.
8. Raise Polyurea gun as Sprayer requests. Spray off Foam gun into trash can to clear out cold material. When spraying pay attention to material and spray pattern to ensure gun and material are working correctly.
9. Lower Foam gun as Sprayer requests.
    a. While layer of Foam is being applied while not moving to far from work area, begin to reel up extension cords and any other equipment that is no longer needed.
10. Raise Foam gun when Sprayer requests.
11. Spray off Polyurea gun into trash can to clear out cold material.
        i. When spraying pay attention to material and spray pattern to ensure gun and material are working correctly.
12. Lower Polyurea gun as Sprayer requests. After lowering gun go to truck and turn foam pump to retract.
13. Go to Foam gun spray Foam in to trash can to relieve pressure from lines. Approximately 10-12 seconds. Take foam gun partially up to truck and set on ground.
    a. Go to truck and begin pulling in Foam hose. Be sure to twist hoses to fit reel correctly from back to front uniformly.
    b. When gun begins to move from pulling hose in go to gun straighten out hose and get any twists out then walk gun back to truck and place on ground. Begin pulling

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foam hoses in, again watching for gun to move. Then repeat process until foam hose is put away.

NOTE

Be sure to not put the Spray Gun through unnecessary abuse. Do Not Drop or Drag Gun. While pulling in hoses be sure to pay attention to the clicking of the Polyurea pump, if the pump stops pumping this means the sprayer has stopped spraying and you are needed at hole. If pump goes full bore for an extended period, you need to check and make sure gun and sprayer are ok and there is not a blown line or other problem.

14. Raise Polyurea gun from structure as Sprayer Requests.
15. Help Sprayer to exit structure as needed.
    a. Once Sprayer is safely out of structure, disconnect sprayer from tripod connections.
16. Spray off Polyurea gun into trash can to clear out cold material.
17. When spraying pay attention to material and spray pattern to ensure gun and material are working correctly.
18. Give Polyurea gun to Sprayer.
19. Place Stamps, tape measurer, and Camera next to Sprayer.
20. Put on Harness to do a double check of hole.
    a. Once Sprayer is done spraying, measuring, stamping, and taking a picture, prepare to enter structure.
    b. Enter structure
    c. While entering structure look at all surfaces of the structure to find any areas where the Polyurea layer is to thin, pinholes, unlined areas, and any other liner deformities.

Coating Procedures with Special Considerations

Coating a Pump Station

When coating a pump station, the general idea remains the same. Put on one layer at a time at the same thickness. The biggest difference is the size of the work area. Other differences are things in the pump station and on the floor of the pump station.

Energy isolation

Make sure that all energy is isolated from the structure. Electrical energy, hydraulic energy, heat energy, or any other type of energy has a high level for potential injury to any workers in or around the structure. It is important to not only know where all energy controls are located but also to know how the controls work.

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Electrical Panel

If the electrical panel is located close to the opening of the pump station it may be necessary to cover it with something so that it does not get damaged by water or overspray during the process.

Pump Rails

If the pump rails are installed and in place in the pump station, wrap them with something so that they do not get covered with overspray while the structure is being lined. The best method is to use saran wrap, like what is found in kitchens. If that does not work, painter's paper, paper towels or something else can also be used. It is not recommended to use tape because the removal process is extended and it is hard to get the tape residue off the rail.

Pipes

Different customers have different feelings on how to treat pipes. Some customers will want you to cover the pipes the same way that you do the rails and others will not care if they get over spray on them. Clarify with the project manager or the customer.

Floats

Floats are sensors that hang from wires. They are round on one side and conical shape on the other. The sensors tell the pumps when to kick on and when to shut off. Remove these when spraying a pump station if they are not already removed. Ensure that these wires do not get not tangled and that it is noted where and how high they were hung. When replacing the sensors, it is very important they are replaced exactly as found.

Pumps

If the pumps are in the pump station, it is imperative that they are covered in some way. Usually a trash bag and tape or saran wrap will work. These pumps are the most essential piece of the operation of that pump station so you want to ensure that they do not become damaged. Do not pull on any of the cords and do not stand on the pumps.

Square Hatch Opening

This is also at the discretion of the customer. Most of the time, 2-3" up onto the metal around the hatch opening will be coated. Some customers will not want any of the hatch coated, in which case just coat to the edge of the hatch.

Flat interior ceiling

This will be one of the trickier areas to coat. Remember that the foam grows towards the point from which it was sprayed. That means in the corner of where the wall meets the flat top will have to be sprayed carefully so as to not leave voids in the foam. One way is to first turn the gun sideways and spray foam directly into the corner to build that corner up. Then face the gun straight up at the ceiling as close to the wall as possible and make quick passes just like when spraying the wall. The technique is just that simple but the act of doing this takes time and practice. While spraying the final layer of polyurea on the ceiling make sure

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to you make quick passes. The polyurea will drip if it is applied too thickly on one pass. Multiple quick passes are the best way to get the ceiling done without drips.

Floor

Pump stations have multiple different floor designs and how each pump station is sprayed is different. Try to not spray the floor if possible. The reason for this because when vacuuming out pump stations a vac truck driver will often drop the tube onto the floor. The force of that tube striking the polyurea and then the vacuum beginning to suck creates a possibility that the floor could work loose and cause the liner system to fail. The preferable way is to line all the way to the bottom of the walls and go 3-6" on to the floor. This gives a good solid coverage down below the lowest point the water could go but it also eliminates a weak point were someone could damage the liner. If the floor must be lined, it should be treated the same as an invert. Ensure that it is completely dry and free of all debris. Use rebar on the edges as well to keep the liner from rising. The floor will be lined with Polyurea only no foam.

Size and depth

Most pump stations are round like manholes. However, pump stations vary in diameter from 5' to 12' or more. The depth ranges from as shallow as 10 feet to as deep as 40' or more. This variance in numbers creates a variance in the exact approach taken to line each structure.

Scaffolding

On a large percentage of pump stations, scaffolding is required. When setting up the scaffolding, start at the bottom and work up. Ensure that the feet of this scaffolding are firmly planted on the floor of the pump station. Secure the scaffolding if it is over 10' tall. The easiest way to do this is to tie it to a stationary object in the pump station such as a ladder rung, pump rail, or pipe. When working on this scaffolding, ensure that the platform is fully in place.

Standing Water

Some pump station jobs will only require coating down to the water level. If this is the case, coat all way down to about 3-6" above the water level with the first layer. Followed by 3-6" above that with the foam and cover all of the first layer with the final layer at the end. Moving up 3-6" helps eliminate the possibility of water splashing on the substrate while spraying the wall.

Primer

In any pump station larger than 6 feet, use a primer system. The primer system is most often OBIC 1500 CPF. These two properties allow the chemical to absorb into the substrate partially and then bond with the polyurea. This makes the adhesion strength much higher. When priming the pump station, start at the top and work down following all procedures pointed out in the primer procedures portion of this book.

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The Lining Process

Pump Stations

Start at the top of the pump station and begin applying the liner system. Apply all 3 layers to one section and then move down to the next section. When applying the foam, do not go all the way to the bottom where the polyurea was applied. Leave some of the polyurea showing so that when moving down to the next section the liner can continue to that layer. Continue this process all the way down until the pump station is complete.

Square structures

When lining a square structure, the application methods are generally the same as in lining any other structure. The biggest difference is the order completing it and spraying flat walls. Often times, in large square structures coat one wall at a time. If it is a smaller but deep square structure, approach it the same way as a pump station. In all square structures, spray some foam directly into the corner, like done with flat top corners, and then smooth it out. This creates strength in these corners and it makes it harder to miss small pinholes in those areas.

Open Air Structures

The largest concern and one major difference when spraying an open-air structure is overspray. These open-air structures will often allow overspray to float away from the work area. This is a major problem because any over spray that floats away could land on consumer products such as vehicles. In addition, this overspray can cause negative respiratory reaction in different members of the local population. Do anything and everything possible to remove the chance of this overspray leaving the work area. That includes closing that jobsite for the day due to wind conditions.

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OTHER PROCEDURES

Filling truck with material

Air Draining Procedure

Need info added.

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TRUCK SUPPLIES & STOCK LISTS

These stock lists are intended to be guidelines to follow. At most, these lists can be considered recommended minimums. Individuals performing tasks should ensure that they have any items they may need whether they are on the list or not.

Prep Truck stock List

Take into consideration any knowledge you have of the job you are going to and add anything you think you may need to the list.

Job Box
Tri-Pod
Harness
Fall Restraint
Gas meter
Angle grinder
Angle grinder cutting blades
Angle grinder grinding blades
Manhole hook
Generator
Extension cord
Eye Protection
Paper Towels
Rubber Gloves
Rope
Bucket
Hammer
Screwdriver Flat
Socket 3/4"
Small Shovel
Utility Knife
Extra Blades
Cones
Channel Locks
Crescent Wrench
Flash Light
Confined Space Sheet
Hydro
Paper Face Masks
Repairs
Chain Saw
5 in 1
Crow bars
Acetone
Repair Material
Half Face Respirator Prepping Items
Water Container (Tote or Barrel)
Pressure washer
Orbital tip
Rinse tip
Pressure washer hose
Wash Suits
Blast Shield
Garden hose
Submersible Pump
Hydrant Adapter
Grouting
Hammer drill
1" Hammer drill bit
3/8" Hammer drill bit
5/8" Hammer Drill Bit
Zerks
Grout Pump
Extra grease fitting for Grout gun
Grouts
Oakum
Single Cartridge Grout Gun
Dual Cartridge Grout gun
Wooden Dowels

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Additional items to consider

Air Compressor
Air Chuck
Plugs
Traffic signs

Spray Truck stock list

Paper Towels	10 rolls
Rubber Gloves	3 box
Safety Glasses	5 pr.
Ear Plugs	1 bx.
Paper Face masks	1 bx.
Troy grout	12 tb.
Fast Foam	12 ct.
Rigid Foam	12 ct.
AV-202-LV	1 can
AV-275/276	1 can
Diamond Grinding Blades	2 ea.
Cutting Wheels	10 ea.
Mold Release	2 can
Hydro	6 pails
Xypex	1 pail
Oakum	10 ft
Drill Bits 51	5 ea.
Drill Bits 44	5 ea.
Hood Shields	30 ea.
Blast shields	2 ea.
Spray Suits	1 bx.
Charcoal Filter	1
Throat Seal Oil	1 gal
Lithium Grease for Pumps	1 tb
Rebar	50 ea.
Trash Bags	1 bx.
Acetone	3 cans
Confined Space Sheets	30 ea.
Manhole Field Report sheets	30 ea.

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Gun Parts stock List

Probler P2 Elite

GX7 DI

Description	Part number	Suggested Qty
Tips	296705 (size 212)	3
Module	296901 (size #4)	3
Coupling block gasket	296128	4
Screw (coupling block mount)	295433	1
Rear seal packing	296829	5
Check valves	296713	8
Screens	296792	15
R-screen screw	295835	1
A-screen screw	295834	1
Rear seal retainer assembly	296864	1
Rear seal gland	295836	1
Valving rod	296863	2
Valving rod holder	296736	2
O-ring	295683	1
O-ring	295681	1
U cup	295496	1
O-ring	103338	1
O-ring	103337	2
O-ring	295685	2
O-ring	106555	8
Locknut	295431	2
Air needle	295712	1
Manuel valve assembly	296970	2
Spring	295676	1
Piston spring	295720	1
Spring (trigger spring)	295442	2
Valve liner	295686	1
Valve spool	295687	1
Cylinder clamp	295690	1
Socket head cap screw	C20003	1

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GapPro

Description	Part number	Suggested Qty
Air seals	296945	10
Bolts (gun block)	296963	2
Module (mixing chamber)	896842 (size #2)	3
O-ring (behind module)	115719	4
O-ring (side seal oring)	248128	10
Side seal	296956	4
Retainer	296957	2
Spring	296959	4
Check valves	296953	6
Block B-side	296966	1 in shop
Block A-side	296965	1 in shop
Screw A or B (screen goes on)	296940	1
seal (screw seal)	296942	2
Screen (screen over screw)	296939	10
Bolt (side block)	296964	2
Snap ring (back of gun on rod)	295422	2
Screw (module screws on)	296563	2
O-ring (on piston shaft)	114054	1
O-ring (on back lock plate)	108103	1
shaft (piston shaft)	296937	2
O-ring (on front of shaft)	C20988	8
O-ring (under cylinder for air)	103337	2
Sear (spring seat)	295434	1
Spring (trigger spring)	296971	2
Liner (trigger liner)	296866	2
O-ring (o-rings for trigger liner)	112085	8
Spool (front of trigger spring)	296527	1
Screw (air port plugs)	102279	4
O-ring (front of piston shaft)	168518	2
Screw (cap for trigger rod)	295695	1
Handle seal repair kit	296938	2
Screw (trigger)	295617	1
Nut (for trigger)	C02032	1
Trigger	295692	1

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TROUBLESHOOTING

General Trouble shooting procedures

Common Problems with equipment

1. Hoses will not Heat up to temperature.
    a. If the hoses will not heat up to temperature, it could be one of many different factors. Check the following items:
        i. Is the hose heater turned on?
        ii. Is the breaker on the power box of the Proportioner on?
        iii. Is it cold (below 30 F)?
            1. If so, you need to ensure that the TCU block is not near a draft or laying on the ground, it needs to be on top of the rack so that is gives an accurate reading of the temperature of the material.
        iv. Is the thermocouple wire hooked up correctly at all connections?
        v. Do you have a bad thermocouple wire somewhere in the lines?
            1. Check this by by-passing certain sections of the wire.
            2. Locate the Hose Block and expose it.
            3. Disconnect the TCU from the purple wire.
            4. Disconnect the purple wire from the machine to the first section of hose
            5. Connect the TCU directly into the machine
            6. If the Heater fails to read at the expected temperature then you have a bad wire or bad connection somewhere in your purple wires.
            7. If this does not change the displayed temperature number then it means either the TCU is bad or the temperature reading is correct.

Unequal ISO and Resin pressures by more than 300 psi

300 psi is used as a reference point because most polyurethane and polyurea products sprayed will vary by as much as 300 psi without degrading the final product. If pressures are off, the first step is to troubleshoot.

The 3 origins for 95% of pressure problems are:

- The Gun
- The Pump
- The Supply

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First action is to ensure that the gun is clean. Many problems begin and end with the gun, especially in warmer weather. Take the gun apart, clean any orifices that are dirty or clogged and put the gun back together to see if it works.

If this does not work, try to figure out whether the problem starts in the pump or the supply to the pump.

With the gun apart, put the whip hoses in trash buckets, open the valves, and turn the pump on for 5- 10 seconds. Watch the flow of the material and see if there is lag in one of the materials or they pump at the same rate. If there is a lag in one of them, this indicates that there is most likely a supply problem on the side that has the lag in it. It is also possible that the chemical with the lag may be too cold making it too viscous.

If it appears to be a supply problem, close the large valve on the sides of the proportioner. Then remove the screens from the Y strainer and check to see if the screen is clogged. If it is, clean the screen and then try to operate the gun again.

If this does not work, check to see the volume coming from the tank. First, take the screen out of the y strainer. Put a bucket underneath the opening and open the valve for 2-3 seconds and watch the rate of flow. Then take the other screen out of the other Y strainer and repeat to see if the amount of material coming from the tanks is relatively the same. If it is not, this indicates that there is a supply problem.

If there is not a supply problem, something else is causing the problem. Check pressurized tanks and ensure that there is adequate air pressure. If they are fed by some sort of transfer pump, you will need to diagnose the operation problem the transfer pump is having.

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ADDITIONAL SUPPLEMENTAL MATERIALS

Item Specific Troubleshooting and Operation Manuals

Proportioner

- PMC
    - PHX40
    - PHX 25
- Gusmer

Spray guns

- Probler P2
- Gap Pro
- GX7 DI
- Fusion AP

Air Compressor

Transfer Pump

- T1
- T2
- T3

Grout Pump

Heat Wagon

Primer Pump

Pressure Washer

Water Pump

Additional info to be added

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OBIC Standard Warranty

OBIC LLC will warranty product only or refund the price of material it finds to be defective that has been installed properly. Except as stated above, the company makes no warranty of any kind, either express or implied, including warranties of merchantability of fitness for a particular purpose, nor does it make any warranty, expressed or implied, of any nature whatsoever with respect to the product of its use. In no event shall the company be liable for delay caused by defects, for loss of use, for indirect, special or consequential damages, or for any changes or expenses of any nature incurred without its written consent.

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