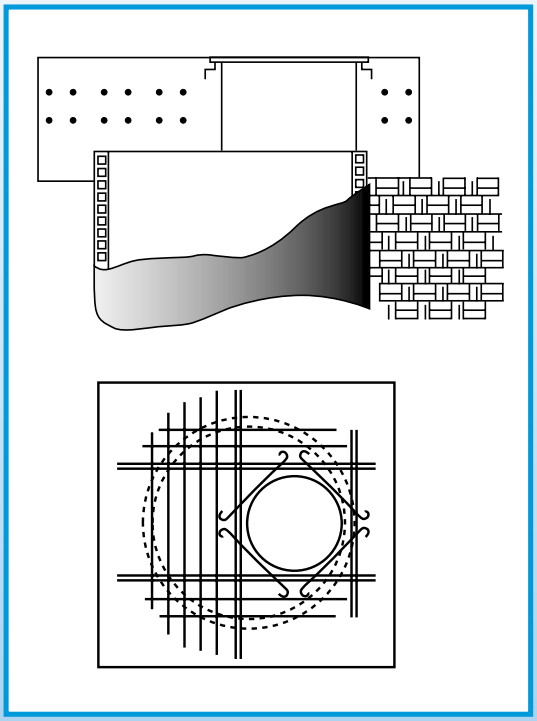
ISCO INDUSTRIES

Polyethylene Manholes for Corrosive Applications

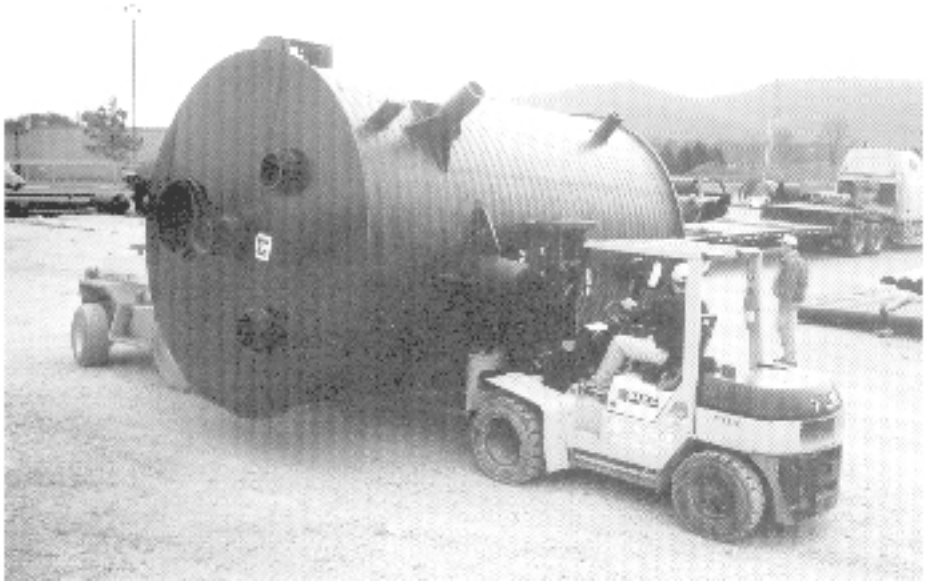


THE POLYETHYLENE PIPE SPECIALIST

TROUBLE-FREE FOR A LONG SERVICE LIFE

ISCO Industries, LLC produces polyethylene manholes, the most trouble-free manholes for a long service life.

- Tough, impact-resistant
- Lightweight, easy to install
- Chemically resistant, no corrosion
- Excellent flow, nonporous surface, no buildup
- Sizes from 36” to 54” standard
- Custom sizes 63” to 120”
- Variety of tops and configurations



Polyethylene is tough! It can bend and flex with various loading conditions. This toughness means fewer potential leaks and longer life.

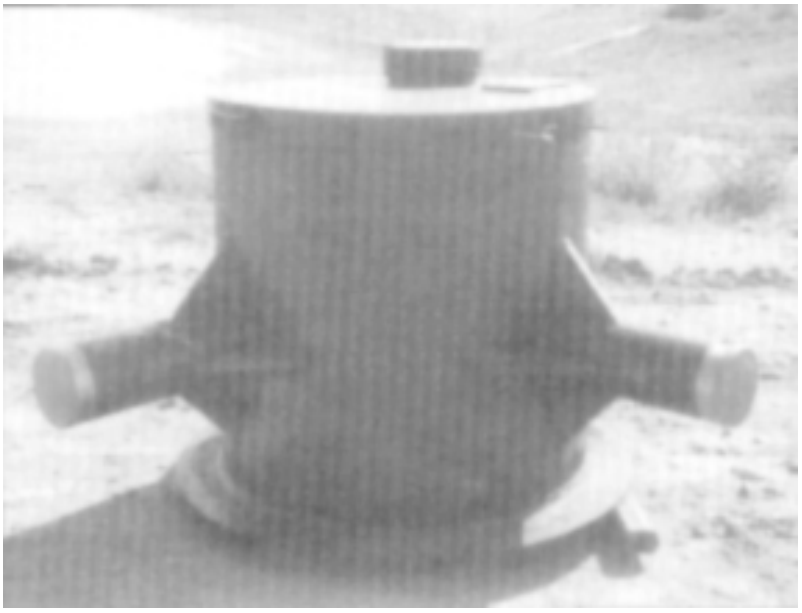
Lightweight polyethylene manholes are easy to install. Smaller pieces of equipment can be used to position these manholes. Inlets and outlets are correctly positioned during the manufacturing process. These inlets and outlets are extrusion-welded into place to be leak-free.

Polyethylene offers a wide range of chemical resistance to acids, bases, and many organic compounds. Because of this resistance, chemical attack from hydrogen sulfide and sulfuric acid does not occur.

Because polyethylene manholes provide the highest level of reliability, applications vary from sanitary sewer uses to handling toxic chemicals.

SANITARY SYSTEMS

In sanitary sewers, hydrogen sulfide is the primary cause of corrosion. Hydrogen sulfide is converted to sulfuric acid, which attacks concrete and eventually destroys concrete manholes and pipe. The ***corrosion resistance*** of polyethylene and its toughness make it a natural for manholes. Polyethylene manholes remain leak-free because there is no chemical attack. The toughness of polyethylene eliminates the chance of cracking during installation.



High density polyethylene valve box.

LANDFILL APPLICATIONS - Leachate Collection Sump

ISCO Industries fabricates manholes and other special purpose HDPE structures for landfills. HDPE manholes are used as cleanouts and valve boxes. They are also used in place of concrete manholes in leachate transport lines.

The chemical resistance of HDPE manholes is very important in landfill applications. Leachate attacks concrete and metal because of its acidic nature. HDPE is virtually inert to most dilute acids and bases.

As garbage is added to a landfill, the loads increase and materials shift. The toughness and strength of HDPE is important. HDPE pipe and manholes are proven in these stringent applications.

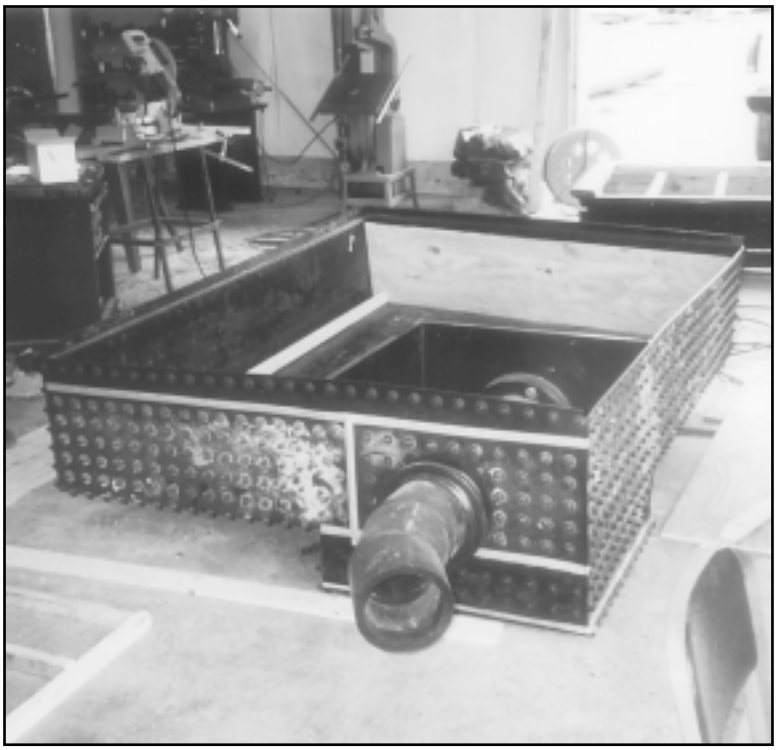
CHEMICAL PLANTS

Plants with corrosive chemicals in their underground pipes are experiencing the benefits of corrosion resistant, high-density polyethylene pipe and manholes. This leak-free system means less pollution and lower operating costs for chemical plants.

By butt fusing high-density polyethylene pipe and flanging the manhole connections, a very tight system is achieved. ISCO Industries' manholes are engineered to fit precisely and all joints are extrusion-welded to prevent leaks.

The pulp and paper industry is a frequent user of HDPE pipes and manholes. The effluent is most often corrosive and may also be abrasive as well. Since high density polyethylene pipe and manholes are corrosion and abrasion resistant, they work well for many industrial and chemical applications.

HDPE manholes can provide a low-point for the annular space in a dual containment piping system. The low point "sump" can then be monitored to provide leak detection or to contain a float switch or lever sensor used as a point switch. Wellhead vaults



HDPE Bekaplast® Sump

are another common use of HDPE manholes.

Complete prefabricated manholes are available from ISCO Industries. Valves, cleanouts, check valves, low-point and other leak detection components are available pre-installed in the manhole as well.

REMEDIATION SITES

HDPE manholes have become the standard at many remediation and clean up sites. When hazardous fluids are being transported, the non-corrosive, leak-free HDPE manholes can be specified with confidence.

One use for HDPE manholes is valve containment. The manhole prevents small leaks from escaping into the environment. Often cleanouts are contained in these sensitive applications.

Remediation Well Head Manhole

SPECIAL PURPOSE STRUCTURES

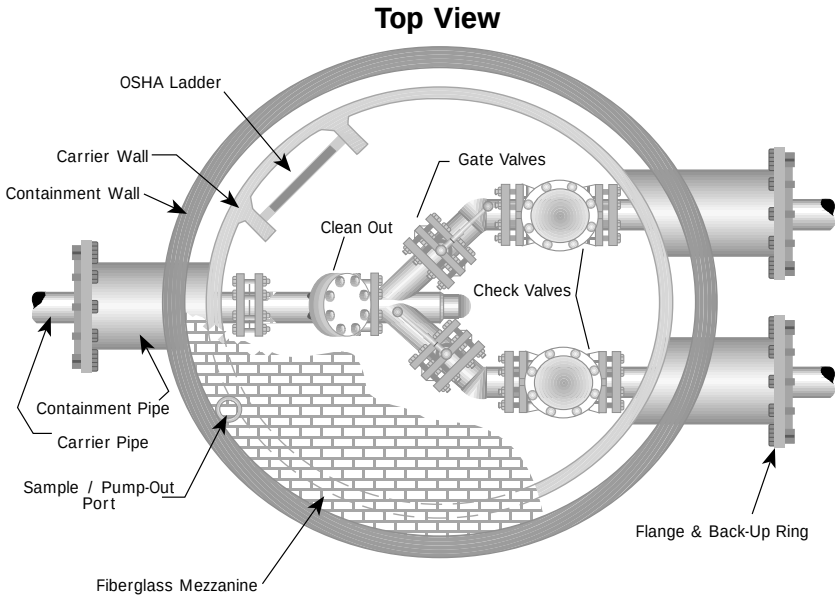
HDPE manholes from ISCO Industries serve many specialized purposes. Whatever your application requirements, a custom designed HDPE manhole structure could be the answer to your needs. Many hazardous and / or toxic materials-handling problems are solved by using HDPE fabricated structures.

The picture below shows an HDPE knock-out pot used for condensing moisture from landfill gas. While methane is the largest component of landfill gas, moisture must be removed to burn or purify this gas. The HDPE knock out pot is used to “dry” the gas before it is burned in landfill flare systems. Moisture is also removed for use in state of the art landfill gas recovery systems.

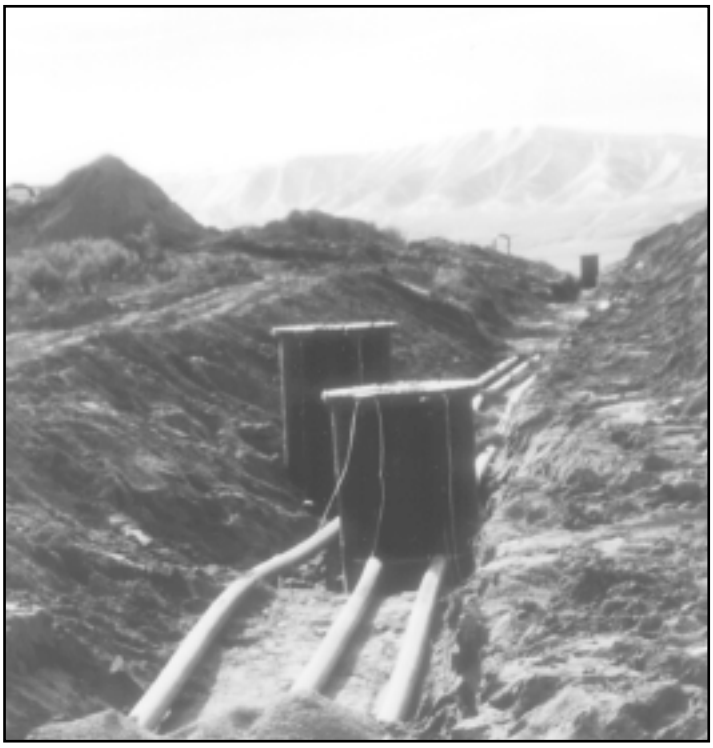
HDPE Methane Knock-Out Pot

VALVE BOXES

The protection of valves and flow measurement instrumentation is another excellent use of HDPE manholes. These “valve boxes” allow easy access to your valves, flow instrumentation, pressure gauges, sample ports, cleanouts, and other piping system components. HDPE manholes can be fabricated as units with all valve and instrumentation components factory installed to make on site installation fast and easy. Pump stations, wet wells and well heads are cost effective uses of HDPE manhole structures. Since HDPE is a very tough ductile material, it is unaffected by pump vibration when properly installed. These structures can also accommodate various leak detection requirements.



Drawing 1.
Dual Contained Valve Operating Manhole



DUAL CONTAINMENT MANHOLES

Dual containment manholes provide many additional options for configuration. This brings challenges for the design engineer. ISCO can help you choose the most effective configuration for your application.

Manholes can be used as an extended annular space providing several leak detection options. This configuration also provides for valve containment. Often the carrier pipe from double wall piping will continue through the manhole itself. This allows piping systems equipment, such as flow control and measurement devices, to be installed in double wall piping inside the containment itself.

MANHOLE DESIGN AND INSTALLATION STANDARDS

ISCO Industries recommends that HDPE manholes be designed and installed in accordance with ASTM F 1759-97, “Standard Practice for Design of High Density Polyethylene (HDPE) Manholes for Subsurface Applications”. This standard addresses the material, structural design requirements of the manhole barrel, floor or bottom and top.

This standard assumes that the HDPE manhole will be installed in backfill consisting of Class I, Class II, or Class III material as defined in ASTM D 2321, which has been compacted to a minimum of 90% standard proctor density. The backfill should extend 3.5 feet from the perimeter of the manhole for the full height of the manhole. This extends laterally to undisturbed in situ soil. Manholes should be placed on a base of stable soil, a concrete base, or bedding. Bedding should be 12 inches in depth and have 95% standard proctor density. The foundation materials must provide adequate bearing strength for the manhole and downdrag loads.

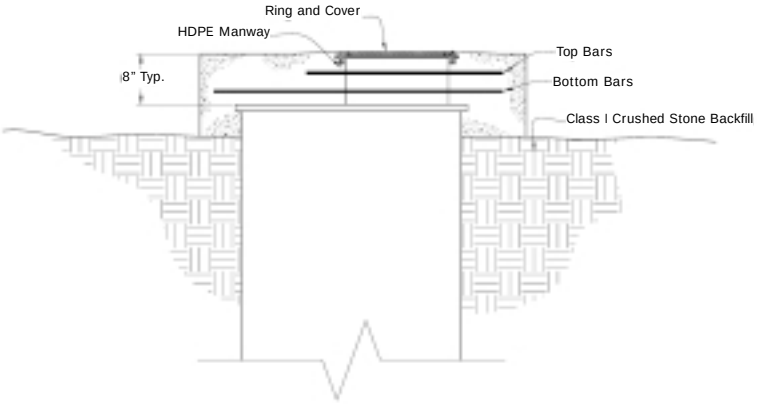
Manholes used in landfills and other areas which experience soil settlement will require special designs. The designer should prepare special specifications for these particular applications.

VEHICULAR LOADS

When HDPE manholes are installed in roads or areas subject to vehicular traffic, a concrete pad which rests on the soil surrounding the manhole is required. The pad should be designed to disperse the live load into the soil.

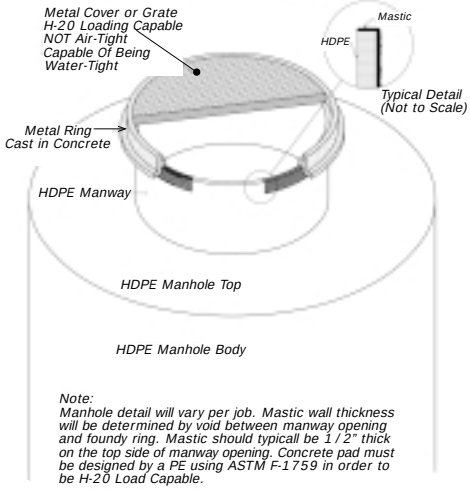
Drawing 2 below shows a typical manhole and pad alignment.

Drawing 2
Concrete Pad Detail



Drawing 3 shows sealing detail for HDPE manhole top and foundry cover.

Drawing 3
Foundry Connection Cover Detail



UNLOADING

Nylon slings are used to unload HDPE manholes from trucks. A fork lift, boom truck or backhole can be used. Match the weight and size of the manhole with the lifting capabilities of the epuipment. A timberbeam can be used inside the manhole between inlets and outlets for easy lifting. Lifting lugs can be fabricated on the manhole when requested.

FLOTATION AND DEFLECTION

When HDPE manholes are installed in areas with groundwater, flotation must be considered. Depending upon the level of the water table, the HDPE manhole must be anchored in place. Reinforced concrete collars are used to prevent flotation. Attachment to the manhole is important. Drawing 8 on page 10 shows a

typical buried HDPE manhole with a lip on the bottom to reduce flotation. The upward lift of the water displaced by the HDPE manhole applies pressure on the bottom of the manhole. This can cause deflection in the bottom. The bottom must be thick enough or reinforced to prevent this from happening.

PUMP MOUNTING

Special provisions must be made when mounting pumps on the base of an HDPE structure. The torque and vibration may cause the integrity of the bolt holes in the HDPE to be compromised. A pump that must be bolted down can be accommodated by a concrete pad, a minimum of 8 inches thick reinforced concrete poured into the bottom of the manhole. Anchor the pump to the concrete via anchor bolts but do not pour the concrete prior till final placement of the manhole. If concrete is poured prior to final placement, the structure may be damaged. All mounting configurations must be approved by the engineer and / or the owner.

MANHOLE DESIGN FEATURES

ISCO Industries produces a variety of manholes to supply a wide range of needs. Many different tops, bottoms, inlets, and outlets are available, including:

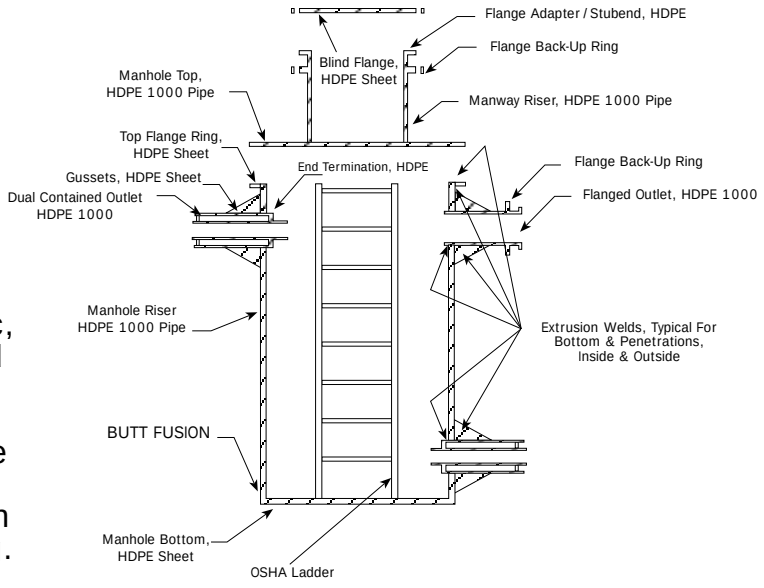
- Flanged Top
- Pipe-Through Manhole
- Flat Bottom
- Dual-Containment Manhole
- Benched Bottom
- Open Top
- Hinged Lids

LADDERS

Polyethylene manholes are covered by OSHA safety standards. Our ladder design has been inspected and meets all OSHA safety requirements.

TOPS AND COVERS

Polyethylene manholes are made with concentric, eccentric, and full opening tops. Flanged, hinged and slip on manway covers are used. Manholes in highway traffic areas require a concrete pad reinforced with rebar which transfers the vehicle or H-20 load to the soil around the manhole. A metal or fiberglass cover with standard cast iron frames and lids are used for direct H-20 loading. Refer to Drawing 2.



Drawing 4. Typical Manhole with Dual & Single Wall Outlets.

For safety reasons, many users prefer the eccentric opening. The eccentric opening provides easier access to the manhole ladder. Drawing 2 shows an eccentrical opening.

Many different styles of tops are used with HDPE manholes for various applications. The basic manhole top designs are full top flanged, flanged manway cover, hinged manway covers, slip on manway cover, and foundry connection. HDPE cones are used in some applications, but are not readily available, and are not a requirement for traffic rating.

In many industrial plants, full top flanges have been used to allow maximum access to the inside of the manhole, see Drawing 6. Depending upon the spacing of the bolts and the thickness of the top and bottom, this design allows for limited pressure and vacuum. As HDPE manholes become larger, the amount of weight that can be applied to the top decreases. These are not traffic rated and are commonly protected with brightly painted pipe bollards.

Flanged, Drawing 4, manway covers are popular in many applications. The manway size is decreased but the ability to seal the structure is increased. This style is used when there is no traffic and the manway is above ground level.

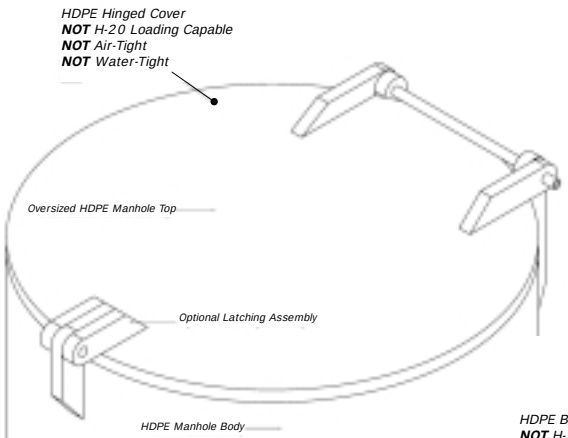
The hinged covers, shown in Drawings 5 & 7, are used in applications requiring quick access to the inside of the manhole. If there are valves in the manhole or if samples are taken from the manhole, the hinged manway offers many benefits.

The slip-on manway cover provides quicker access than a flanged top and better sealing that a hinged top. This style cover is used in landfills and chemical plants. Drawing 7 shows this design.

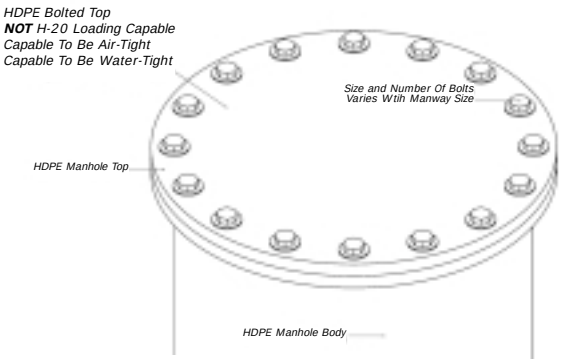
INLETS, OUTLETS, & INVERTS

Inlets and outlets for polyethylene manholes can be attached anywhere around the circumference of the manhole. Extrusion welding is used to attach polyethylene pipes to the body of the manhole. Inlets and outlets should have welded gussets. This method of welding provides tough, strong connections.

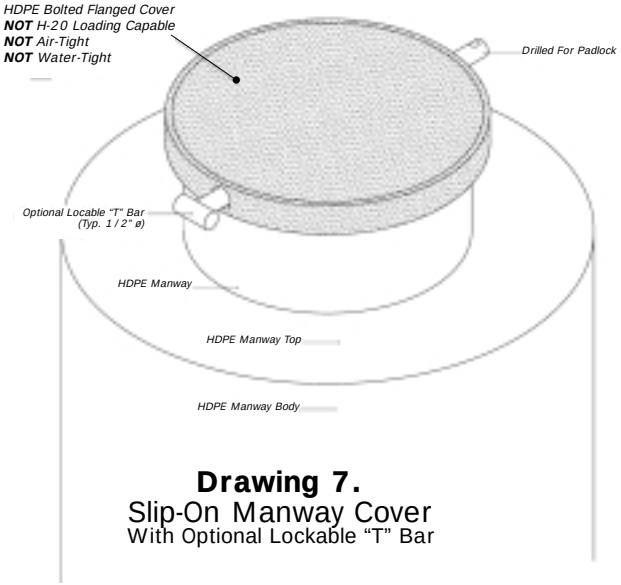
Inverts are often open or a pipe can continue through the manhole. Where flow is critical, the benched or pipe-formed bottom is available. The open bottom allows for proper flow in applications with adequate slope.



Drawing 5.
Hinged Cover Detail



Drawing 6.
Bolted Cover Detail



Drawing 7.
Slip-On Manway Cover
With Optional Lockable "T" Bar

ANCHORING

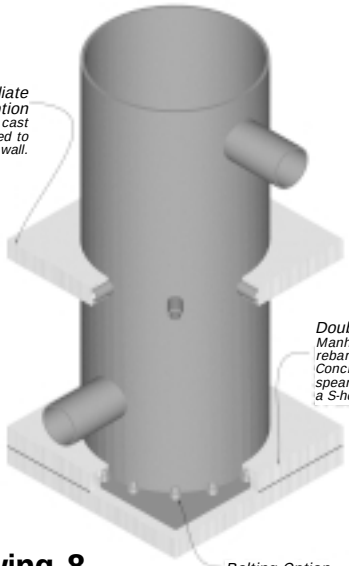
There are three types of anchoring options for HDPE manholes. The first relates to installation of HDPE manholes below the water table. The second is for industrial applications involving large changes in temperature. When HDPE manhole are installed below the water table, the manhole displaces water. The upward lift of the displaced water tries to push the manhole out of the ground.

By extending the bottom of the manhole, a lip is created. The weight of soil on this lip holds the manhole in place. By casting a concrete ring over this lip, additional area and weight are applied and holds the manhole in place. Drawing 8 shows this detail.

When a lip is used, bolts can be used to hold the manhole in place. This is shown as the "Bolting Option" in Drawing 8.

Another method of holding the manhole in place is to cast concrete above the lip. Rebar should be placed in the slab poured above the lip. This is shown in Drawing 8 as the "Double Pour Option".

A third option is to use an Intermediate Anchor Ring (shown in Drawing 8). A rebar reinforced concrete slab is casted above the inlet and outlet pipes. Anchor lugs are welded to the body of the manhole to prevent sheer forces from being applied to the inlet and outlet pipes if the slab sinks. Note that anchor lugs can be used as an alternate to oversized bottoms.



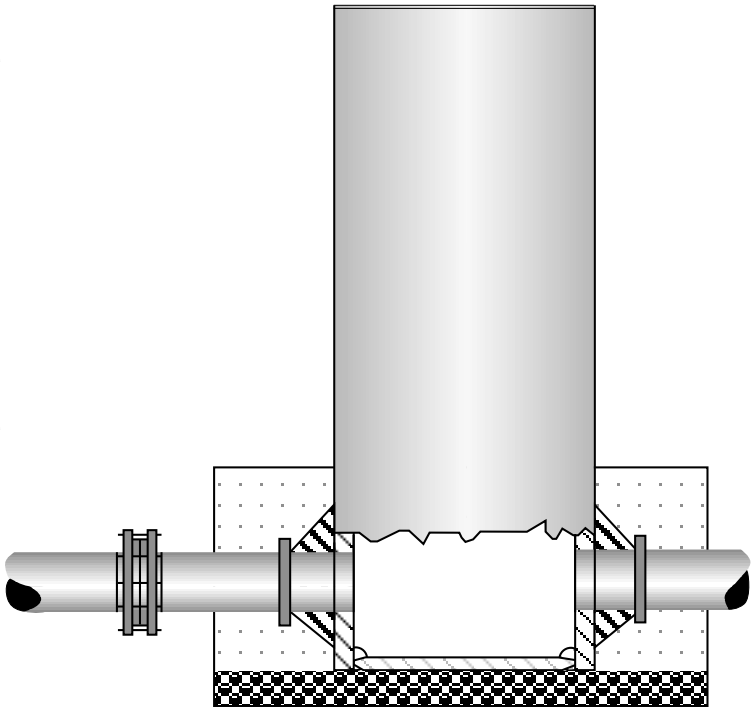
Drawing 8

Many industrial sewer applications experience large changes in temperature. This change in temperature causes the high-density polyethylene pipe to expand and contract. If the HDPE manholes are not designed to handle these forces, the inlet and outlet connections to the manhole may fail.

To prevent forces of expansion and contraction from reaching these connections, a waterstop is welded to the high density polyethylene pipe.

This is needed because concrete does not adhere to high-density polyethylene pipe. The waterstop forms a mechanical attachment point, transferring forces away from the manhole. Drawing 9 shows this detail.

Concrete encasement of the manhole base in industrial plants is good practice, as it prevents flotation and protects the manhole connections



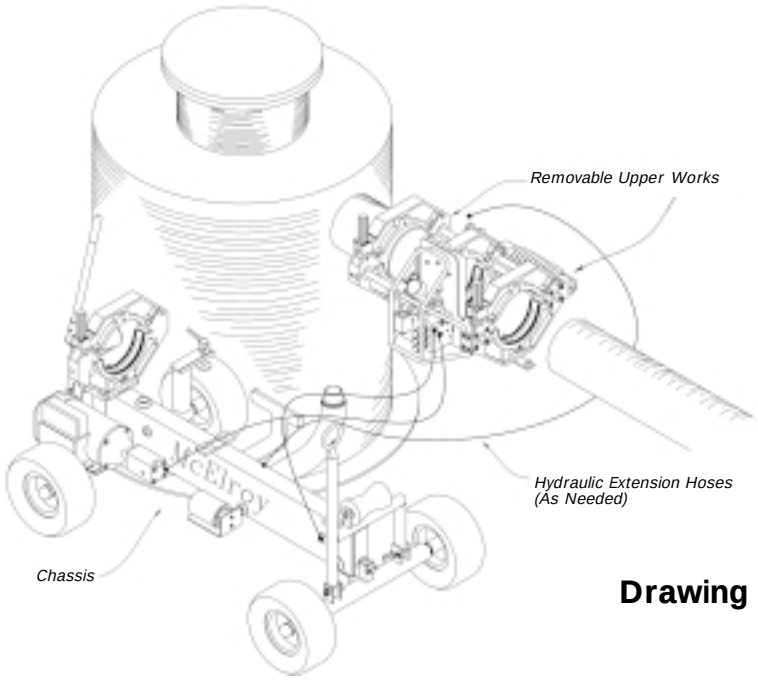
Drawing 9

from the forces of expansion and contraction. A rebar cage is then built around the waterstop and pipe. Rebar is needed because unreinforced concrete will break when stressed.

Gussets are used as reinforcement, providing additional strength to inlet and outlet connections.

CONNECTIONS TO MANHOLES

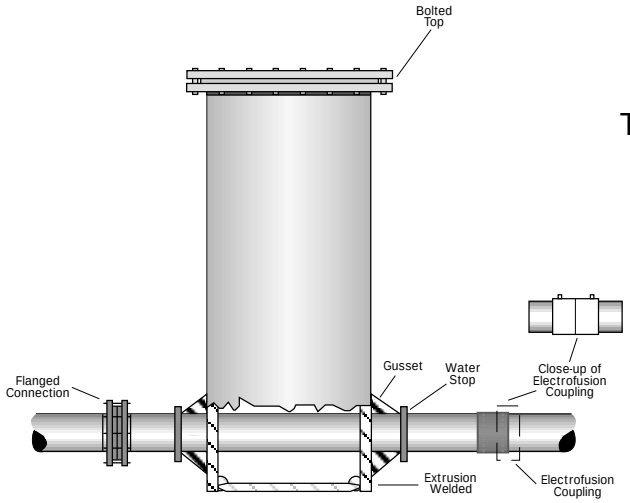
Butt fusion is the most common way to join HDPE pipe. To make a butt fusion weld you must be able to get pipe movement. When making tie-in connections to manholes, butt fusion welds are often difficult. Standard welding procedures do not change, but special considerations for manhole, pipe, fusion machine, and field conditions must be adjusted. Drawing 10 shows a butt fusion machine making an in the trench weld of pipe to an HDPE manhole.



Drawing 10

In most industrial applications, flanges are used to join manholes to solid wall pipe. Flanges provide strong, leak-free connections and can handle the expansion-contraction that often occurs. Flanges also offer an excellent method to mate to alternate piping materials.

Electrofusion couplings offer a fast, corrosion resistant connection when used with high-density polyethylene manholes. No movement of the pipe or manhole is required when used with a single wall pipe. These couplings fuse HDPE pipes together for leak-free connections. Drawing 11 shows flanged and electrofusion connections.



Drawing 11.
Typical flange and electrofusion connections

Specifications for High Density Polyethylene Manholes

1. GENERAL

This specification shall govern the materials and fabrication of high-density polyethylene manholes.

2. SCOPE OF WORK

This contract covers the purchase and fabrication of high-density polyethylene manholes.

3. MATERIALS

The pipe for the manholes shall be made from high-density polyethylene (HDPE) resins meeting the following requirements:

3.1. HDPE MATERIAL SPECIFICATIONS

3.1.1. HDPE Material – The HDPE material supplied under this specification shall be high density, high molecular weight as supplied by ISCO INDUSTRIES, LLC. Louisville, KY. The HDPE material shall conform to ASTM D-3350-98a with minimum cell classification values of 345464 C. Earlier versions of this specification will not be accepted.

3.1.2. PHYSICAL PROPERTIES OF HDPE COMPOUND

3.1.2.1. Density- the density shall be no less than 0.955 gms / ccm as referenced in ASTM 1505.

3.1.2.2. Melt Index- the melt index shall be no greater than 0.15 gms / 10 minutes when tested in accordance with ASTM 1238-Condition 3.2.3.

3.1.2.3. Flex Modulus-flexural modulus shall be 110,000 to less than 160,000 psi as referenced in ASTM D 790.

3.1.2.4. Tensile Strength at Yield – tensile strength shall be 3,200 to less than 3500 psi in accordance with ASTM D 638.

3.1.2.5. Slow Crack Growth Resistance shall be per ASTM F 1473 (PENT Test). The results shall be greater than 100 hours.

3.1.2.6. Hydrostatic Design Basis shall be 1,600 psi at 23 degrees C when tested in accordance with ASTM D 2837.

4. SUBMITTALS AND QUALITY ASSURANCE

4.1. QA / QC CERTIFICATION-

4.1.1. The manhole supplier shall submit certification that the HDPE material meets the specifications.

4.1.2. The fabricator of the manholes shall submit drawings showing the position of the inlets, outlets and the overall dimensions along with any other special features such as manways, ladders, etc.

4.1.3. The fabricator shall submit data indicating that the manholes meet the requirements of ASTM F 1759, “Design of High Density Polyethylene (HDPE) Manholes for Subsurface Applications”. The manhole should be proven to have acceptable design for the following areas:

4.1.3.1. Ring Compressive Strain

4.1.3.2. Combined Ring Compressive and Ring Bending Strain

4.1.3.3. Ring Buckling

4.1.3.4. Axial Stain

4.1.3.5. Axial Buckling

4.1.3.6. Thickness of the bottom based on depth and groundwater. Thickness should be based on acceptable stress and deflection amounts.

4.1.4. Calculations supporting these requirements will be part of the submittal package.

4.1.5. The fabrication technician shall perform work in accordance to butt fusion of high-density polyethylene per ASTM D2657 and for extrusion and hot air welding per ASTM C 1147. The fabricator shall submit the written quality assurance program used during fabrication of the manholes. The fabricator may be required to submit their overall QA / QC program for fabricating thermoplastic structures, the welding certification program for the fabrication technician per ASTM C 1147 and the facility safety program.

4.1.6. The manholes and pipe shall be tested with water or air. The structure shall be determined to be leak free before shipping. A written certification shall be sent to the engineer certifying the manholes are leak free. The test results shall become part of the submittals. An identification

plate indicating, the job number, testing data, and when built and by whom, shall be attached to the manhole.

4.2. Approval or Rejection
- 4.2.1. Written approval or rejection of substitution given by the ENGINEER.
- 4.2.2. ENGINEER reserves he right to require proposed product to comply with color and pattern of specified product.
- 4.2.3. In the event substitution results in a change of Contract Price or time, provisions in the Agreement will be applied for adjustment.
- 4.2.4. Substitutions will be rejected if:
  - 4.2.4.1. Submittal is not through the CONTRACTOR with his stamp or approval.
  - 4.2.4.2. Requests are not made in accordance with this Section.
  - 4.2.4.3. In the ENGINEERS opinion, acceptance will require substantial revision of the original design.
  - 4.2.4.4. In the ENGINEERS opinion, substitution is not equal to original product specified or will not perform adequately the function for which it is intended.

4.3. THIRD PARTY TESTING- The owner or the specifying engineer may request certified lab data to verify the physical properties of materials not meeting the requirements of this specification.

4.4. DEVIATIONS- Procedure for requesting substitute
- 4.4.1. Consider after award of Contract.
- 4.4.2. A letter defining the deviation and justification must be sent to the engineer. The letter must identify:
  - 4.4.2.1. The Product
  - 4.4.2.2. Manufacturer's Name
  - 4.4.2.3. Representative Contact Name and Telephone Number
  - 4.4.2.4. Specification Section or drawing reference of originally specified product
  - 4.4.2.5. Discrete name or tag number assigned to original product in the Contract Document.
- 4.4.3. Manufacturer's literature clearly marked to show compliance of proposed product with Contract Document.
- 4.4.4. Itemize comparison of original and proposed product addressing product characteristics including but not necessarily limited to :
  - 4.4.4.1. Size
  - 4.4.4.2. Composition or material of construction
  - 4.4.4.3. Weight
  - 4.4.4.4. Electrical or mechanical requirements
  - 4.4.4.5. Product Experience:
    - 4.4.4.5.1. Location of past projects utilizing product
    - 4.4.4.5.2. Name and telephone numbers of persons associated with referenced projects knowledgeable concerning proposed product.
    - 4.4.4.5.3. Available field data and reports associated with proposed products
  - 4.4.4.6. Data relating to changes in construction schedule
  - 4.4.4.7. Data relating to changes in cost.
  - 4.4.4.8. Samples: At request of the Engineer, a full size sample may be required. This sample maybe held by the Engineer until completion of the project

4.5. REJECTION – The high-density polyethylene manholes may be rejected for failure to meet any of the requirements of this specification.

5. HDPE MANHOLE CONSTRUCTION

5.1. The HDPE manholes shall be constructed of HDPE pipe with a nominal OD of _____ and a DR of _____ . For sizes above 63", a profile wall pipe can be used. The service conditions will determine the class of pipe. Calculations must be provided to verify the wall thickness to be used.

5.2. The bottom thickness of the manholes will be determined in accordance with ASTM F 1759. Calculations must be provided to justify the thickness of the bottom.

5.3. The inlets and outlets shall be extrusion welded on the inside and outside of the structure using good welding practice. Gussets shall be attached at 90 degrees, 180 degrees, 270 degrees, and 360 degrees around the inlets and outlets unless impractical.

5.4. All manhole connections larger than 4" nominal OD pipe shall be butt fusion welded, electrofusion welded or flanged connections. For 4" OD pipe and smaller threaded transition fittings can also be used as well as the acceptable connections listed.

5.5. Manholes shall be factory tested with water or with air. The hydrostatic test shall be conducted by filling the structure with water and checking for leaks. Minimum test duration will be one hour. If air is used, 2 to 5 psi shall be used for 30 minutes. Data showing the structure to be leak-free will be supplied. The owner or his representative may request to observe the test.

5.6. The ladders in the manholes, if specified, shall conform to OSHA requirements.

5.7. Top of the manhole shall be built to the requirements of the drawings. If air testing is required, flanged tops or manways will be required. Reinforced concrete pads spanning the HDPE manhole will be required when HDPE manholes are used in traffic areas. A traffic rated frame and cover will be required. A professional engineer shall approve the design of the concrete pad. His calculations must be included in the submittal.

5.8. Where large changes in temperature are expected, restraints shall be designed as an integral part of the manhole by the fabricator / manufacturer to prevent strain at the inlets or outlets. These restraints shall be cast into a concrete collar around the pipe. Anti-flotation and / or anti-settling anchor collars, if required, shall be designed as an integral part of the manhole by the fabricator / manufacturer of the manhole. Shop drawings, approved by the specifying engineer, shall be required for restraints, anchors, collars, etc... that are designed by the manhole fabricator / manufacturer prior to acceptance of the HDPE structures.

6. CONSTRUCTION PRACTICES

6.1. Handling of Manholes. HDPE manholes shall be stored on clean, level, and dry ground to prevent undue scratching or gouging of the pipe. The handling of HDPE manholes shall be done in such a manner that there is no damage. Nylon slings are often used.

6.2. Flanged Connections. Flange adapters (where shown in the drawings) shall be attached to HDPE manhole inlets and outlet stubs during fabrication by butt fusion welding per ASTM D 2657. A ductile iron back up ring will be used with each flanged connection. The rings will use a standard ANSI 150# bolt pattern. Check the drawings for materials required for corrosive conditions.

6.2.1. Bolts shall be tightened in a “star pattern” to recommended torque values.

6.2.2. Bolts must be tightened a second time after 24 hours to insure a positive seal.

6.2.3. Gaskets are not required on HDPE to HDPE connections.

6.3. Pipe Joining. HDPE pipe shall be joined using butt fusion. All butt fusion welds shall be made as described in ASTM D 2657. Electrofusion welding can be used for making pipe welds. Hot air and extrusion welding are not permitted for pipe joining. All pipe and fittings welds shall be made using a McElroy Manufacturing Datalogger. A record of the temperature, pressure and graph of the fusion cycle shall be maintained by the contractor.

6.4. Handling of Fused Pipe- Fused segments of pipe shall be handled so as to avoid damage to the pipe. Limit bending of the pipe welded to fittings or manholes. Nylon slings are preferred.

6.5. Equipment Mounting- Special provisions must be made when mounting pumps in an HDPE manhole. Bolting directly to the wall of the HDPE structure is never recommended.

7. DIRECT BURIAL INSTALLATION

7.1. Trench Construction- The trench and trench bottom shall be constructed in accordance with ASTM D-2321, Section 6, Trench Excavation, and Section 7, Installation. The HDPE manhole shall be installed on a stable base consisting of 12” of Class I materials compacted to 95% proctor density per ASTM F 1759, Section 4.2. All required safety precautions for manhole installation are the responsibility of the contractor.

7.2. Embedment materials- Embedment materials shall be Class I or Class II materials as defined by ASTM D2321, Section 5, Materials. Class I materials are preferred. Backfill and bedding materials shall be free of debris.

7.3. Bedding of the manhole shall be preformed in accordance with ASTM D 2321, Section 7.2. Compaction shall conform to Section 7.5 and 7.51 .

7.4. Backfilling shall be shall be done to conform to the ASTM F 1759, Section 4.2, “Design Assumptions”. This Specification indicates that backfill shall extend at least 3.5 feet beyond the edge of the manhole for the full height of the manhole and extend laterally to undisturbed soils. Compaction shall be to 90% proctor density.

7.5. H-20 Highway Loads- Reinforced concrete pads spanning the HDPE manhole will be required when HDPE manholes are used in traffic areas. A traffic rated frame and cover will be required. A drawing showing key design features must be submitted as indicated in Section 5.7 of this specification.

Typical Polyethylene Manhole Installations

Project and Location	Manhole Diameter(s)	Height	Description / Comments
Landfill Leachate Recirculation - Covel Gardens Landfill, Texas	48”	6 feet	Manholes used for containment of valves and piping connections.
Nuclear Restoration - Washington	36”, 48”, 54”	8 - 15 feet	Dual line dual containment manhole
Bleach Plant; Acid Sewer - Southeastern Paper Mill	48”	9 feet	Manholes made with butt fused bottoms and tops. System designed to prevent chlorine escape.
Leachate Collection Pump Station Manhole	48”	10 feet	Manholes used as collection sump. Pumps installed to move leachate in 4” pipe to pond. Two 4” inlets and one 4” outlet to force main.
Landfill Leachate Collection - New York	82”	8 - 18 feet	Leachate collection lines connect to manholes to provide access.
Chemical Plant Outfall - Southeast U.S.	48”	25 feet	Manhole used to combine flow from several polyethylene lines.
Dual Contained Collection Sump - Gulf Coast Chemical Plant	54”	6 feet	Manhole used to collect process run off. Dual contained HDPE pipe connected to sump with dual contained outlet.
Single Containment and Dual Containment Manholes - Lipari Landfill Superfund Site, New York	48”, 54”	6 - 15 feet	Part of dual contained piping system for Superfund project. Pipe sizes include 4” x 8”, 6” x 10”, 12” x 16”, 18” x 24”.

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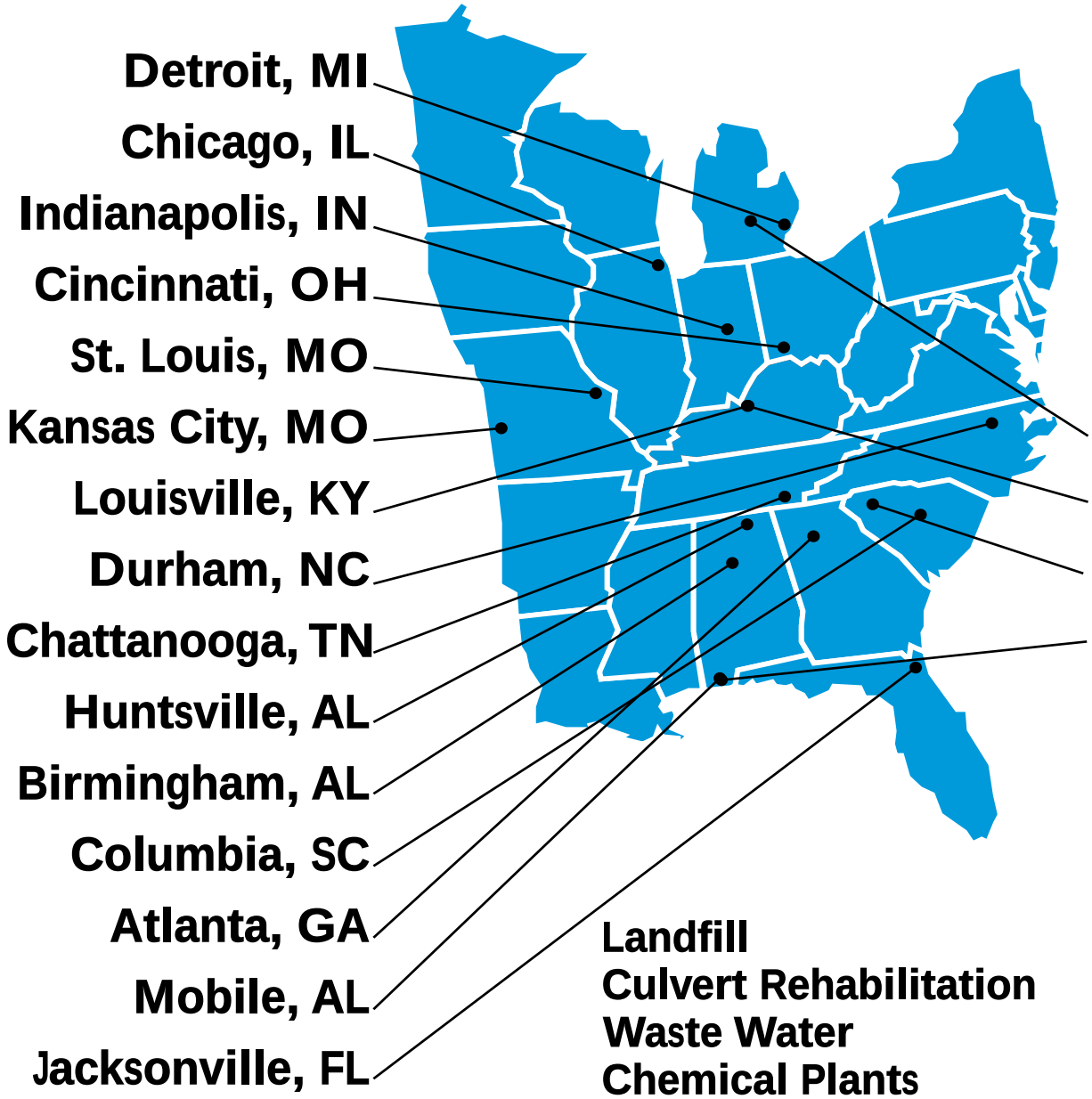

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