Installation Guide

Vortex Flow™

ODOR & CORROSION CONTROL

MUNICIPAL SYSTEMS

- Sewer Drop Structures
- Pumping Stations
- Forcemain Discharge
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DISCLAIMER

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RECOMMENDED PRACTICES FOR THE INSTALLATION OF IPEX INC., VORTEX FLOW INSERT

INTRODUCTION

This booklet will answer the needs of contractors looking for general recommendations on how to install the Vortex Flow Insert. Out-of-the-ordinary conditions not covered here should be referred to the Engineer or his inspectors to provide on-site solutions. In such cases IPEX Inc. advice is always available. Our objective is to encourage the use of methods that lead to a professional installation that will ensure the maximum effectiveness of the Vortex Flow Insert.

The Engineer who designs the Vortex manhole will determine how it should be installed. It is not our intention that the Guide should assume that responsibility. This booklet sets out the preferred methods of installation based on IPEX Inc. experience. Users can receive additional helpful advice available from IPEX Inc. upon request.

Customer Service Center at 1-800-268-4664

VORTEX FLOW INSERT OVERVIEW

DESCRIPTION

The Vortex Flow Inserts patented spiral flow design eliminates odorous and corrosive gases in a unique way. It uses the wastewater’s own flow energy to suppress the turbulence which releases noxious gases. The spiral flow created in the Vortex Top Form accelerates the flow as it enters the Vortex Drop Shaft. As the sewage spirals down the drop shaft it creates a downdraft which traps airborne gases and forces air into the sewage flow to oxidize odorous gases. The sewage exits the structure with reduced H₂S, increased dissolved oxygen and less velocity. No moving parts, no electricity, no chemicals and no filter media are needed to address the odorous and corrosive gases that are generated in typical drop structures.
PATENT INFORMATION

The Vortex Flow Insert designed and manufactured by IPEX Inc. is covered under U.S. Patents No. 6,419, 843, and RE40,407.

The patent abstract states:

The invention relates generally to applications whereby it is desirous to introduce or reintroduce gas with liquid flowing through pipes, and/or mix two fluids within a pipe. In particular, this method can be used, but is not so limited, to mix and entrain air and other odorous gas emissions and to reduce hydrogen sulfide corrosion and abrasive wear in waste water conveyance, collection and treatment systems.

ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFI</td>
<td>Vortex Flow Insert</td>
</tr>
<tr>
<td>DIF</td>
<td>Design Information Form</td>
</tr>
<tr>
<td>EDP</td>
<td>Energy Dissipation Pool</td>
</tr>
<tr>
<td>CIOD</td>
<td>Cast Iron Outer Diameter</td>
</tr>
<tr>
<td>IPS</td>
<td>Iron Pipe Size</td>
</tr>
<tr>
<td>H₂S</td>
<td>Hydrogen Sulfide</td>
</tr>
<tr>
<td>DO</td>
<td>Dissolved Oxygen</td>
</tr>
<tr>
<td>CSA</td>
<td>Canadian Standards Association</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>AWWA</td>
<td>American Water Works Association</td>
</tr>
</tbody>
</table>

MATERIALS

<table>
<thead>
<tr>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSA B137.3</td>
<td>Polyvinyl Chloride (PVC) Pipe</td>
</tr>
<tr>
<td>AWWA C900</td>
<td>Polyvinyl Chloride (PVC) Pipe 10” thru 12”</td>
</tr>
<tr>
<td>AWWA C905</td>
<td>Polyvinyl Chloride (PVC) Pipe, 14” thru 48”</td>
</tr>
<tr>
<td>ASTM D2241</td>
<td>Polyvinyl Chloride (PVC) Pressure Rated Pipe (SDR Series)</td>
</tr>
<tr>
<td>PVC SHEET</td>
<td>Polyvinyl Chloride (PVC) Sheet to be of 1/8” minimum thickness</td>
</tr>
<tr>
<td>ROVING</td>
<td>24 oz/sqyd minimum</td>
</tr>
<tr>
<td>MAT</td>
<td>1-1/2 oz/sqft minimum</td>
</tr>
<tr>
<td>DERAKANE</td>
<td>Grade 470 – 300 minimum</td>
</tr>
</tbody>
</table>
PARTS DESCRIPTION

Vortex Top Form
The top portion or headwork’s of the Vortex Flow Insert. Components of the Top Form include the entrance piece, the deflection plate, the Vortex Channel and the Vortex Top Cut.

Drop Structure
The structure in which the Vortex Flow Insert will be installed.

Deflection Plate
The angled plate at the inlet that directs the flow into the Vortex Flow Channel.
Entrance Piece
The Entrance Piece is designed to accommodate the inlet pipe. It may be a flanged open channel or a pipe large enough to accept the influent line. See the design engineers specifications to determine how the entrance piece and the inlet line are to be connected.

Vortex Drop Shaft
The Vortex Drop Shaft is the vertical pipe in which the sewage spirals down. The shaft may come in more than one piece and will have a slip coupling or flange as a means of assembling the shaft.

Vortex Channel
The channel that directs the flow at the Vortex Top Form entrance to the Vortex Top Cut.

Energy Dissipation Pool
The Energy Dissipation Pool is where the sewage is mixed and exits the Vortex Flow Insert.
PRE-DELIVERY PREPARATION

The following items are to be evaluated/designed and supplied by others prior to the installation of the Vortex Flow Insert (IPEX Inc. recommends using a licensed engineer in the state the Vortex Flow Insert will be installed);

Strapping or Anchorage of Vortex Form
The Vortex Form (top portion of the Vortex Flow Insert) will need to be secured to the structure.

Strapping or Anchorage of Vortex Shaft
The length of the Vortex Shaft may require additional support and securement to the structure.

Sealant
Sealant or a gasket may be required on the face of the top form flange mating to the structure wall.

Support under Larger Vortex Forms
All Vortex Top Forms that have a diameter larger than 57” will require support under the bottom of the Top Form. The supports must be designed assuming the Vortex Top Form is full of sewage.

Manhole / Structure Integrity
It is recommended that the manhole/structure the Vortex Flow Insert will be installed in is verified to have the structural integrity to handle the weight and forces generated by the addition of the Vortex Flow Insert and the appurtenances used to hold it in place.

Base/Benching
Ensure the manhole/structure base is designed to accommodate the Energy Dissipation Pool. It must be flat and large enough for the Energy Dissipation Pool to rest on. Appropriate benching may need to be designed.

Bolts and Related Hardware
The bolts and other related hardware for strapping, supports, flanges, back up rings, restraints, etc will need to be considered.

Weight of Unit
Ensure the contractor will have appropriate equipment to lift and handle the Vortex Flow Insert upon delivery.
RECEIVING AND HANDLING VORTEX FLOW INSERTS

BEFORE ACCEPTING SHIPMENT

Each Vortex Flow Insert is custom fabricated and manufactured according to strict standards. Quality Control inspection of the products before they leave our plants ensures that only the highest quality products are shipped. Damage to the VFI is possible during shipping and must be checked before the shipment is received and signed for by the contractor.

1. The contractor should inspect each VFI prior to being unloaded.

2. Carefully note any sign of damage to the VFI in the form of cracks, chips or other damage.

3. DO NOT THROW AWAY ANY DAMAGED MATERIAL. Mark it carefully for further inspection by the carrier or their representative.

4. Notify the carrier immediately and enter a claim for damaged or missing parts in accordance with their instructions.

5. If there is any damage to the VFI please call IPEX Inc. and ask for a Vortex Specialist at 1-800-268-4664.

HANDLING

The VFI should come with specific instructions detailing where to lift the product in order to offload and handle it. If these documents are not present please call IPEX Inc. and ask to speak with a Vortex Specialist 1-800-268-4664.

STORAGE AT THE JOB SITE

The preferred method of storage at the job site is in the crates as shipped and away from high traffic areas to ensure the VFI doesn’t get broken.
EXTREME COLD TEMPERATURES

Although PVC has very good impact resistance, it can offer slightly reduced impact resistance at very low temperatures (below freezing). Do not allow the VFI to be exposed to excessive force.

REMOVE TEMPORARY LIFTING DEVICES

As a convenience, temporary lifting apparatus are commonly shipped on the Vortex to insure correct lifting points and prevent damage to the Vortex. Once the unit is installed, ALL metal lifting bars, lifting eyes and clamp-on restraints are to be removed. Lifting eyebolts in the EDP must be removed before any benching occurs.

PROLONGED OUTDOOR STORAGE

Prolonged exposure of the VFI to the direct rays of the sun will not damage the PVC. However some mild discoloration may take place in the form of a milky film on the exposed surfaces. This change in color merely indicates that there has been a harmless chemical transformation at the surface of the PVC. Physical properties such as pipe stiffness and tensile strength are unaffected by surface discoloration. However, a small reduction in impact strength could occur at the discolored surfaces. These are of a very small order and will not affect a proper field installation. IPEX products that are exposed to sunlight will still exceed all of the impact requirements of the standards. Discoloration of the PVC can be avoided by shading them from the direct rays of the sun. This can be accomplished by covering the VFI with an opaque material such as canvas. If the VFI is covered, always allow for the circulation of air through the VFI to avoid heat buildup in hot summer weather. Make sure that the VFI is not stored close to sources of heat such as boilers, steam lines, engine exhaust outlets, etc.
There are a few things to consider before attempting to install the Vortex Flow Insert. This section will walk you through the pre-installation preparation to ensure you’re ready to install the VFI.

**CRITICAL MEASUREMENTS**

A → A’  Check that the Vortex opening (A) is able to adapt to the structures in-line (A’).

B → B’  Verify that the VFI’s drop height (B) is such that the in-line and the VFI opening will mate when the Vortex is sitting in its final resting place (B’).

C → C’  Verify that the bottom of the structure (C’) has a flat level surface large enough for the VFI’s Energy Dissipation Pool (C) to rest.

If there are any discrepancies with A → A’ or B → B’, please call IPEX Inc. at 1-800-268-4664 and ask to speak with a Vortex Specialist.
STRAPPING

The VFI needs to be secured in place using a stainless steel strapping system. Before attempting to install the unit the straps should be designed and fabricated. Please refer to the design engineers specifications to determine the location and size of the straps required to secure your Vortex in place. Below are examples of some very effective straps used on other installations.
SEALANT

There are instances that require some form of sealant placed between the entrance flange and structure wall. The primary function of the sealant is to maximize the amount of sewage that enters the Vortex Flow Insert. This sealant is to be evaluated/selected and supplied by others prior to the installation of the Vortex Flow Insert.

Some examples of sealant used are as follows;

- 3M 605 Urethane Sealant
- Waterplug Caulking by Dolphin Sealants 800-469-1677 www.dsealants.com
- Hilti C-100 Sealant 800-879-8000 www.us.hilti.com
- 3M Scotch Seal-Chemical Grout 5610 Gel, I.D. # 62-5610-8521-8
- Sikaflex 1a – One-Component, Polyurethane. 800-933-SIKA www.sika.ca
- Quikrete – QUIKRETE® Non-Shrink Precision Grout #1585-00
- Butyl Caulk – sample of material used for flange face before securing. (IPEX Inc. does not specifically endorse or recommend any of the sample sealant products mentioned in this section)
INSTALLATION

ENERGY DISSIPATION POOL

The Energy Dissipation Pool is one of the most critical aspects of the Vortex Flow Insert. Therefore, the proper installation of the EDP is crucial. Always keep in mind that the cut-outs in the Vortex Drop Shaft need to be submerged at all times.

EDP Provided

The Energy Dissipation Pool is the ‘cup’ at the bottom of the manhole. The most important detail when installing this EDP is to ensure there is a flat level surface for it to rest on at the bottom of the structure. See the design engineers specifications for benching around the EDP.
VOXTORX DROP SHAFT

Installing the Vortex Drop Shaft is very simple in most cases. Depending on the amount of drop height the shaft can come as one piece or in many pieces. When the shaft comes in more than one piece intermediate connections must be made. These connections will come in the form of a PVC coupling. Below are assembly instructions for these connections.

PVC COUPLING

A VFI with a coupling connection in the Vortex Drop Shaft is great because the spigot end can be cut to achieve the appropriate height. Here are the step by step procedures for cutting and assembling a PVC coupling connection.

1. Mark various points around the OD of the pipe where it should be cut.

2. Draw a line by connecting the various points preferably with a flexible sleeve or by using any other method available on site.

3. Use a handsaw and mitre box or mechanical saw to cut squarely on the outside of the line about 1/16” to 1/8”. A diagonal cut will affect the functionality of the VFI.

4. Remove all burrs from both the inside and outside of the pipe with a knife, file or reamer. Burrs can create hang-ups inside the surface walls and affect the VFI’s operation.

5. Chamfer with grinder to create a 45° taper on the OD of the pipe. The chamfer should be large enough to clear the PVC weld on the inside of the coupling.

6. Remove dirt, grease and moisture; a thorough wipe with a clean dry cloth is usually sufficient.
7. Measure the coupling depth and mark an insertion line to make sure the pipe is fully inserted. It is important that there is only a minimal gap between the pieces of drop shaft.

8. Prior to pipe insertion into the coupling, smear a lubricant inside the coupling and on the plain end of the pipe. The lubricant will make pipe joining possible. The lubricant will also allow for easier removal if there is ever a need.
VOlTEX TOP FORM

There are two distinct types of Vortex Top Forms, those that are Self Supporting and those which need to be Supported by other means. Vortex Flow top forms less than 63” in diameter will be self supporting and VFI’s larger than 63” will require third party engineered supports under the top form. You can tell the difference between the two by the gussets that are present under the Top Form of Self Supporting units and the absence of gussets on units that require support.

Self Supporting                      Supported

Flanged Entrance

The Vortex top form will come with a flanged entrance piece. Holes can be drilled through the flange into the structure wall and bolts inserted for temporary securement until the straps are installed. **Bolts alone** will not permanently secure top form to the structure.

The installation of a Self Supporting Top Form and a Supported Top Form varies only in the way they are supported and secured. Check the design engineers specifications to see how the Top Form is supposed to be supported and secured.

The only real difference when installing a Vortex Top Form is the Style in which it adapts to the influent line. Below are instructions on how to adapt the three different styles of Vortex Top Forms.
INLET OPENING

1. Insert the influent line into the Inlet Opening of the Vortex Top Form.

2. Mark the influent line to the same radius as the Vortex Top Form.

3. Move the Vortex Top Form out of the way and cut the influent line along the marked radius.

4. Re-insert the influent line into the Inlet Opening making certain it extends into the Vortex Top Form only 1/4" to 3/4".

5. Now see the design engineers specifications to determine how the Vortex Top Form is to be secured in place.

6. Once the Top Form is in its final resting place seal the annular space around the influent line and the Inlet Opening using the design engineers specified product.
FLANGED ENTRANCE

1. The influent should be finished flush to the inside of the structure and properly sealed as per design engineers instructions.

2. If specified by the design engineer apply sealant or caulking on the face of the flange or the structure wall.

3. Now see the design engineers specifications to determine how the Flanged Entrance is to be fastened to the structure.

NOTE: If the flanged face is secured to the structure wall with nuts or bolts do not over tighten.

CAUTION: The Flanged Entrance piece is not intended to support the weight of the top form. The straps specified by the design engineer are required to secure the top form in place.

4. Again refer to the design engineers specifications to see how the Vortex Top Form is to be secured to the structure.

5. Once the Top Form is in its final resting place if required seal the connection between the Flanged Entrance and the influent line using the engineers specified product.
1. Insert the influent line into the Entrance Piece of the Vortex Top Form.

2. Mark the influent line so that it will extend no more than 1-1/2" into the Entrance Piece.

3. Move the Vortex Top Form out of the way and cut the influent line along the mark made in step 2.

4. Re-insert the influent line into the Entrance Piece making certain it doesn’t penetrate the Entrance Piece more than 1-1/2" and it will not push against the Vortex when the straps are secured.

5. Again refer to the design engineers specifications to see how the Vortex Top Form is to be secured to the structure.

6. Once the Top Form is in its final resting place seal annular gap around the influent line and the Entrance Piece using the design engineers specified product.
STRAPPING

STRAPPING THE TOP FORM

Securing the VFI to the structure is one of the most important steps of the installation. If the unit is not properly secured there are numerous issues that may arise so ensuring this is done properly and following the design engineers specifications is tremendously important. Below is some information for the strapping and the anchors: (The values given are for informational purposes only and it’s ultimately the responsibility of the design engineer to ensure the straps and anchors specified will suffice.)

- 2” x 1/8” stainless steel strap if ONE single strap is used on the top of the Vortex Top Form – This leads to a FOS on the strap of 10.9;
- 2” x 1/8” stainless steel strap if TWO straps are to be used, one on the top and one on the bottom of the Vortex Top Form – This leads to a FOS on the strap of 21.8.

STRAPPING THE DROP SHAFT

Depending on how tall the VFI Drop Shaft is there may be a need to secure the shaft as well.

The design engineers specifications should indicate whether the shaft needs to be secured, the type and size of securement and the location.

Common practice is to secure each section of pipe used in the drop shaft in two locations.

<table>
<thead>
<tr>
<th>Top Form (inches)</th>
<th>Shaft Diameter (inches)</th>
<th>Min. Strap Area (in²)</th>
<th>Anchor Pull-out spec with a FOS of 2.5 (lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 or less</td>
<td>24</td>
<td>0.0052</td>
<td>500</td>
</tr>
<tr>
<td>76</td>
<td>30</td>
<td>0.0084</td>
<td>700</td>
</tr>
<tr>
<td>80</td>
<td>36</td>
<td>0.023</td>
<td>1800</td>
</tr>
<tr>
<td>96</td>
<td>42</td>
<td>0.0315</td>
<td>2500</td>
</tr>
</tbody>
</table>
SECURING THE ENERGY DISSIPATION POOL

Securing the EDP will depend on the type of EDP utilized and the specifications of the design engineer. There should be no movement of the EDP when the installation is complete and no potential for movement when the VFI is in operation.

EDP PROVIDED

If the EDP is supplied by IPEX Inc. and will be benched into place as indicated in drawing on page 10, then the EDP will not be required to have additional securing.

The design engineer may specify that the EDP be secured to the base of the structure using anchor style bolts. Drilling through the base of the EDP once it is in its final resting place can done. It is recommended to use a large flat washer under the bolt or nut when securing in place. Stainless hardware is recommended.

If straps on the drop shaft are in close proximity to the EDP they may provide the support necessary. Shaft strapping proximity to the EDP is to be specified by the design engineer.
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A policy of ongoing product improvement is maintained. This may result in modifications of features and/or specifications without notice.