Installation Guide

Vortex Flow™

ODOR & CORROSION CONTROL

MUNICIPAL SYSTEMS

- Sewer Drop Structures
- Pumping Stations
- Forcemain Discharge

IPEX
by aliaxis

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RECOMMENDED PRACTICES FOR THE INSTALLATION OF IPEX USA LLC 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 USA LLC 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 USA LLC experience. Users can receive additional helpful advice available from IPEX USA LLC upon request.

Customer Service Center at 1-800-463-9572

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 H_2S, 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 USA LLC 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.

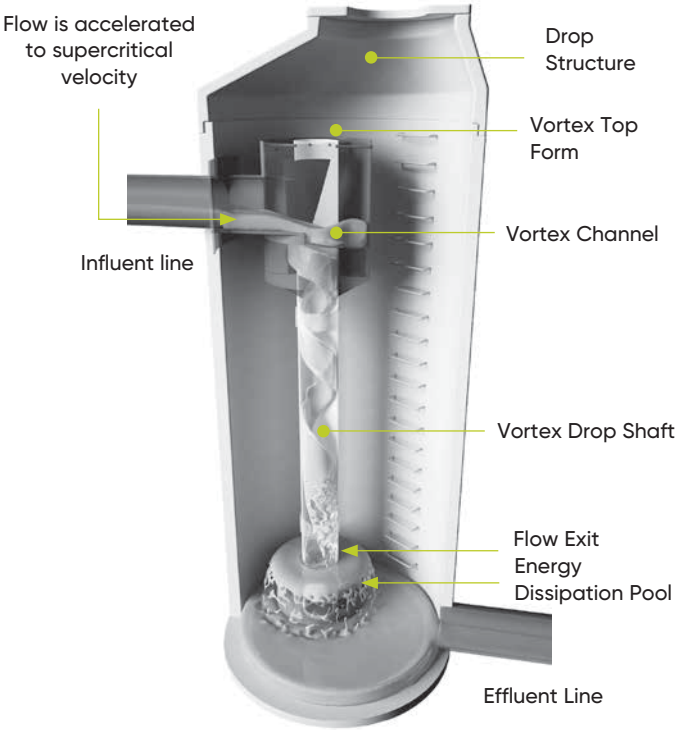
ABBREVIATIONS

VFI	Vortex Flow Insert
DIF	Design Information Form
EDP	Energy Dissipation Pool
CIOD	Cast Iron Outer Diameter
IPS	Iron Pipe Size
H_2S	Hydrogen Sulfide
DO	Dissolved Oxygen
CSA	Canadian Standards Association
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association

MATERIALS

CSA B137.3	Polyvinyl Chloride (PVC) Pipe
AWWA C900-16	Polyvinyl Chloride (PVC) Pipe
ASTM D2241	Polyvinyl Chloride (PVC) Pressure Rated Pipe (SDR Series)
PVC SHEET	Polyvinyl Chloride (PVC) Sheet to be of 1/8" minimum thickness
ROVING	24 oz/sqyd minimum
MAT	1-1/2 oz/sqft minimum
DERAKANE	Grade 470 – 300 minimum

PARTS DESCRIPTION



Vortex Top Form

The top portion or headworks 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 will be a flanged channel 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 USA LLC recommends using a licensed engineer in the state the Vortex Flow Insert will be installed);

Strapping or Anchorage of Vortex Top Form

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

Strapping or Anchorage of Vortex Drop Shaft

The length of the Vortex Drop 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 Top 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 USA LLC and ask for a Vortex Specialist at 1-800-463-9572.

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 USA LLC and ask to speak with a Vortex Specialist 1-800-463-9572.

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.

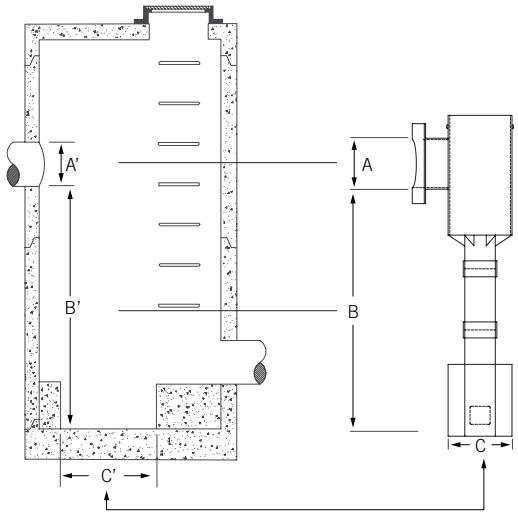
PROLONGED OUTDOOR STORAGE

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.

PRE-INSTALLATION PREPARATION

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').

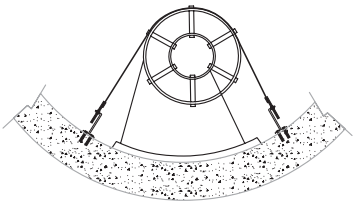
C → C' Verify that the bottom of the structure (C') has a flat level surface large enough for the VFI's Energy Dissipation Pool (C) to rest.

If there are any discrepancies with A → A' or B → B', please call IPEX USA LLC at 1-800-463-9572 and ask to speak with a Vortex Specialist.

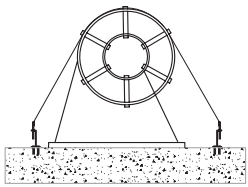
STRAPPING

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.

Typical Strapping Method

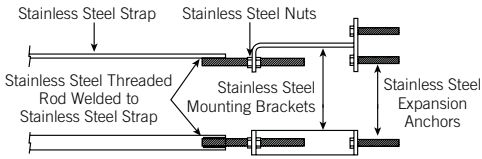


Curved Wall



Flat Wall

Strapping Detail



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/designed and supplied by others prior to the installation of the Vortex Flow Insert.

Some examples of sealant used are as follows;

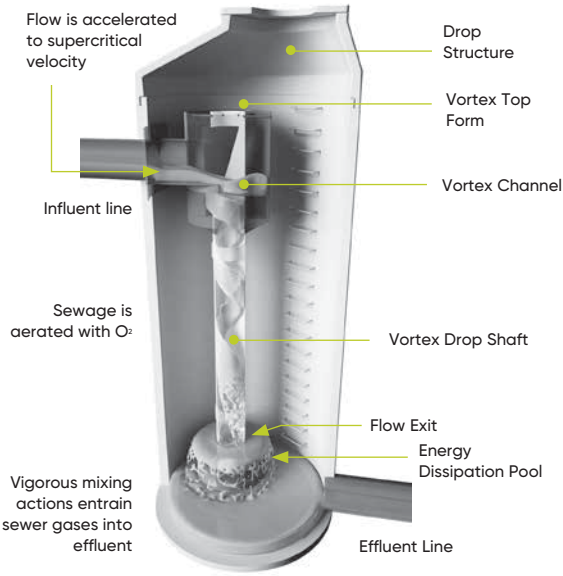
- 3M 605 Urethane Sealant
- Waterplug Caulking by Dolphin Sealants 800-469-1677 www.dsealants.com
- Hilti C-100 Sealant 800-879-8000 www.us.hilti.com
- 3M Scotch Seal-Chemical Grout 5610 Gel, I.D. # 62-5610-8521-8
- Sikaflex 1a – One-Component, Polyurethane. 800-933-SIKA www.sika.ca
- Quikrete – QUIKRETE® Non-Shrink Precision Grout #1585-00
- Butyl Caulk – sample of material used for flange face before securing. (IPEX USA LLC 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



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.

VORTEX 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.

VORTEX 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 57" in diameter will be self supporting and VFI's larger than 57" will require third party engineered supports under the top form. The need for external supports will be noted on the design drawing.

Self Supporting

Supported

Flanged Entrance

The Vortex top form will typically 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.

FLANGED ENTRANCE

1. The influent pipe 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.

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.)

Top Form (inches)	Shaft Diameter (inches)	Min. Strap Area (in^2)	Anchor Pull-out spec with a FOS of 2.5 (lbf)
60 or less	24	0.0052	500
76	30	0.0084	700
80	36	0.023	1800
96	42	0.0315	2500

- 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.

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 USA LLC 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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All of the Company's Products are guaranteed against defects resulting from faulty workmanship or materials. The Company will replace, free of charge, including shipping charges for the replacement Products, any Products which are found to be defective in workmanship or material, provided that the following conditions are met:

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b. The defect is not due, without limitation, to faulty installation, misalignment of Products, vibration, ordinary wear and tear, corrosion, erosion, U.V. degradation, incompatible lubricants, pastes and thread sealants, unusual pressure surges or pulsation, water hammer, temperature shocking, or fouling; and

c. The Products have not been altered or modified after leaving the company's premises.

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Markets served by IPEX group products are:

- Electrical systems
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- PVC, CPVC, PP, ABS, PVCO, PEX, FR-PVDF and PE pipe and fittings (1/4" to 48")
- Industrial process piping systems
- Municipal pressure and gravity piping systems
- Plumbing and mechanical piping systems
- PE Electrofusion systems for gas and water
- Industrial, plumbing and electrical cements
- Irrigation systems

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