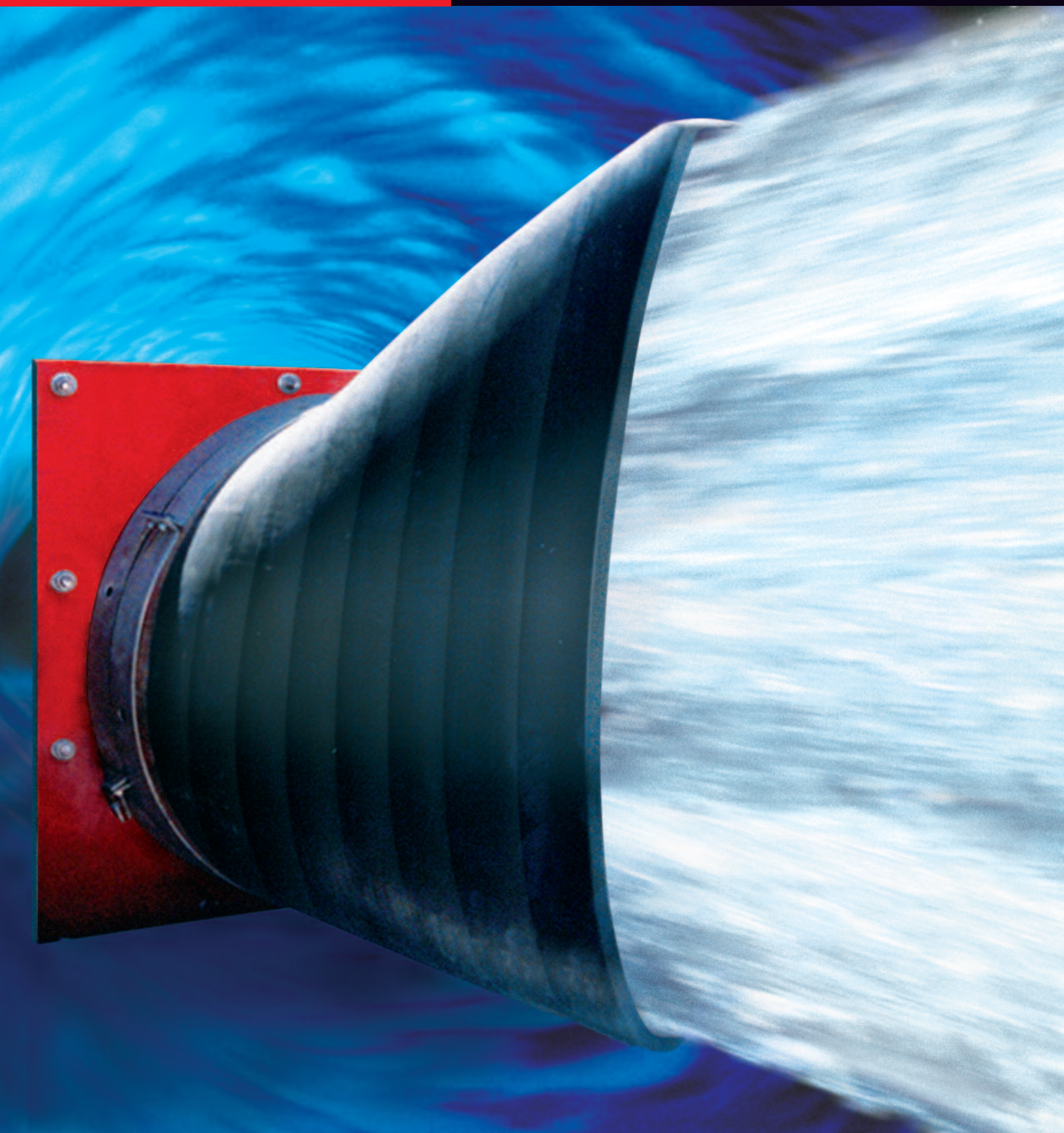
Tideflex® Technologies

THE TIDEFLEX® ADVANTAGE

Still Ahead of the Curve!



Tideflex® Technologies

Spiros G. Raftis

Founder

Building on a Legacy of Leadership.

Nearly 60 years ago, Spiros G. Raftis founded Red Valve Company on a simple promise: provide the highest quality engineered valves, with an unsurpassed level of technical innovation—anywhere. And with that promise began a legacy of leadership—and a never-ending quest to solve the toughest challenges and exceed our customers' expectations. As today's world leader in pinch valve and check valve technology, that legacy lives on each day at Red Valve Company and Tideflex® Technologies. It is supported by Mr. Raftis' son Chris, along with the hundreds of Red Valve and Tideflex Technologies employees dedicated to keeping the promise Mr. Raftis made more than 50 years ago. Being the world leader in valve technology is more than a slogan—it's a promise. And it's one we intend to keep for a long, long time. Call us any time. We're ready to speak with you personally—right now.

"We hope you find the information provided here to be useful. It is part of our ongoing commitment to provide the technical innovation and support that have made Tideflex® products the world standard for more

Chris R. Raftis
President

Tideflex® Technologies

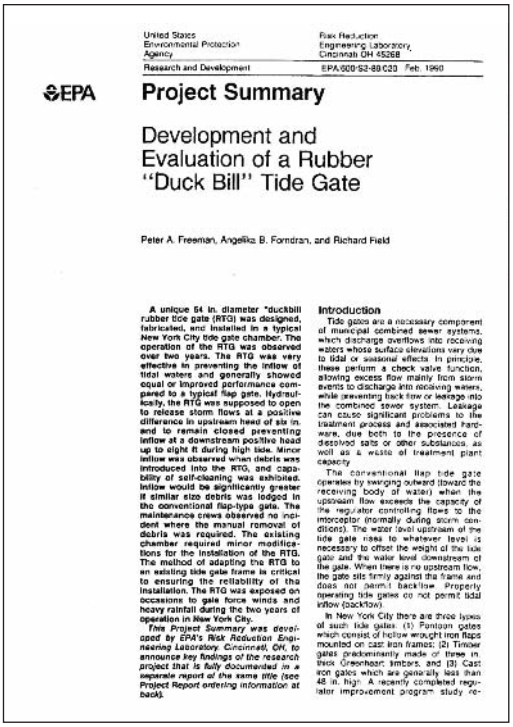
A Pioneer in the Check Valve Industry

In 1984, the United States Environmental Protection Agency (EPA) commissioned Tideflex® Technologies to develop and test an alternative to flapgate valves. In their report, *Development and Evaluation of a Rubber "Duck Bill" Tide Gate*, the EPA states, "Increasing the reliability and performance of tidegates has a beneficial impact on the general pollution abatement program for the nation's waterways."

In response, the elastomer "duckbill" Tideflex® Check Valve was developed to eliminate the operational and maintenance problems associated with flapgate check valves, including corrosion of mechanical parts, freezing open or shut, warping and clogging due to entrapped debris.

Problem

Solution



United States Environmental Protection Agency
Risk Reduction Engineering Laboratory, Cincinnati OH 45268
Research and Development
EPA-600/S2-89/033 Feb. 1990

EPA

Project Summary

Development and Evaluation of a Rubber "Duck Bill" Tide Gate

Peter A. Freeman, Angelika B. Formdran, and Richard Field

Introduction

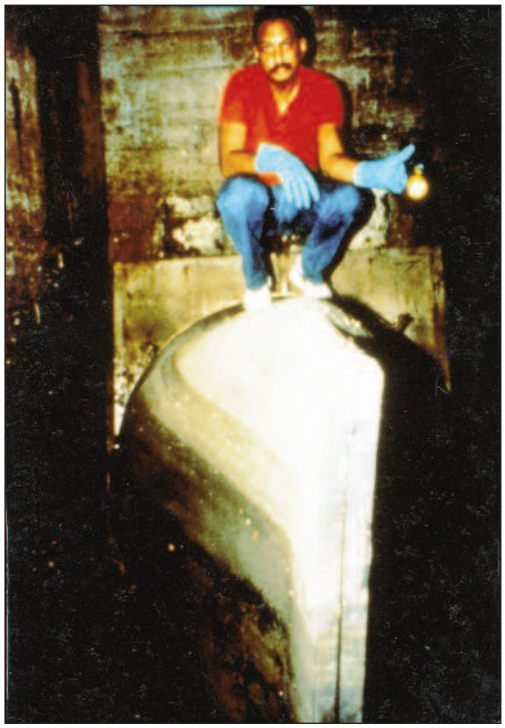
The EPA report, stating the benefits of Tideflex® Check Valves.

The EPA rigorously tested the Tideflex® Check Valve for two years and found that the valve showed, "Significant improvement over flapgate valves in terms of leakage inflow, entrapment of debris, capability to self clean and susceptibility to marine fouling."

Richard Field, United States EPA, stated the following in regard to the development of the Tideflex® Check Valve:

> "Tide water intrusion is costing the United States multi-millions of dollars because it is water that really doesn't have to be treated that intrudes into the sewer system and treatment plants. In the long run, there will be a lot of money saved for the minor investment that we made here."

Since its creation in 1984, years of research and development, testing and proven performance have combined to make the Tideflex® Check Valve today's most reliable valve for backflow prevention. In fact, the first check valve that Tideflex® Technologies sold in 1984 is still in service today. Currently, over 600,000 Tideflex® Check Valves are solving inflow and intrusion problems around the world.



Twenty-six years later, the original 54" Tideflex® Check Valve (as shown above) is still in operation.

THE TIDEFLEX® ADVANTAGE

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The Tideflex® Advantage

The Tideflex® Check Valve is a revolutionary design for backflow prevention. Our check valves offer low cracking pressure to eliminate standing water. They also have low headloss and are not affected by rust, corrosion or lack of lubrication.

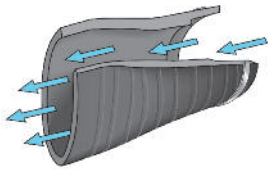
Tideflex® Check Valves are cost-effective because they require no maintenance or repairs and have a long life span. The valves operate using line pressure and backpressure to open and close, so no outside energy source is required. Tideflex® Check Valves make excellent replacements for ineffective metal flapgate valves because they have no moving parts that can corrode, warp or freeze.

Tideflex® Technologies' 25-plus years of proven field operation, research and development and continued engineering enhancements have all combined to make our check valves the most reliable in the industry today. Our check valves achieve the tightest possible seal for backflow applications, particularly at low flow rates. When you specify a patented Tideflex® Check Valve you are guaranteed a proven record of maintenance-free backflow prevention.

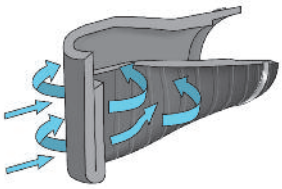
This document is intended to give our customers a firm understanding of the technical differences between check valves from Tideflex® Technologies and check valves from other manufacturers. The Tideflex® Advantage ensures that you receive a superior check valve through our:

- Rigorous EPA Testing
- Independent Hydraulic Testing
- In-house Testing
- Finite Element Analysis (FEA)
- Hydraulic Variations
- Curved Bill Design
- Eccentric TF-1 Check Valve
- Stronger Structure
- Increase in TF-1 Bill Height
- Increase in Flow Capacity
- Eccentric Flat-Bottom Design
- Proper Specifications

PRINCIPLE OF OPERATION



The Tideflex® Check Valve opens with positive pressure.



Reverse pressure seals the Curved Bill of the Tideflex® Check Valve to prevent backflow.

ENGINEERED FEATURES

- No Moving or Mechanical Parts
- 100% Elastomer Construction
- Low Headloss
- Sensitive Enough to Open With as Little as 1" of Water Pressure
- Custom-built to Your Flow Specifications
- Cost-effective, Reliable Replacement for Traditional Flap Gate Valves
- Silent, Non-slamming
- Self-draining, Eliminates Standing Water

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Independent Hydraulic Testing

Tideflex® Technologies has conducted extensive independent hydraulic testing of check valves since the 1980s.

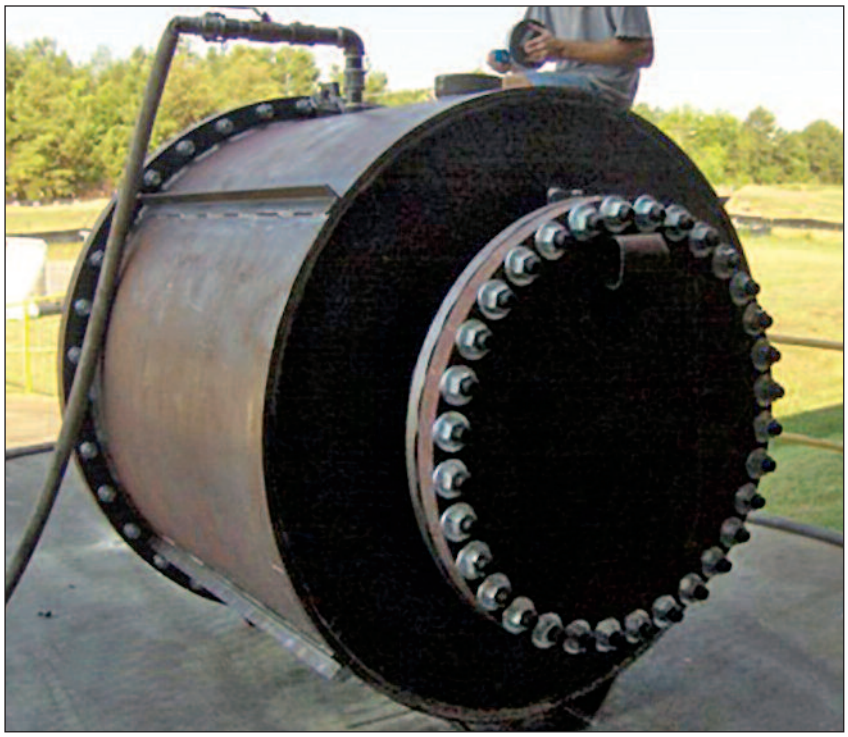
Comprehensive testing was required and a massive amount of data was analyzed to model the effect of valve geometry and relative stiffness on hydraulics. Check Valves were tested from 2"-48" in numerous hydraulic variations within each size. Valves were tested for free discharge, submerged and partially submerged conditions.

With this extensive amount of test data, Tideflex® Technologies developed modeling programs used to provide hydraulic characteristic curves for every Tideflex® Check Valve.

In-house Testing

To supplement the independent hydraulic testing, Tideflex® Technologies continually conducts research and development and testing to improve existing products and to develop new products. In addition, extensive field studies are conducted to validate product design for long-term performance.

A Tideflex® Check Valve being tested by an independent laboratory.



In-house backpressure testing of a 36" Tideflex® Check Valve.

Independent testing of a 48" Tideflex® Check Valve.

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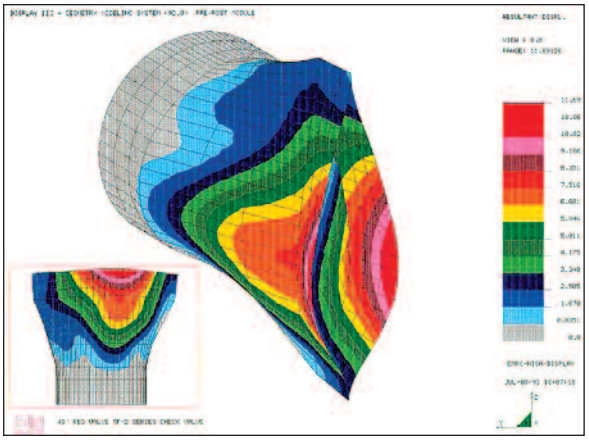
Finite Element Analysis (FEA)

From the outside, Tideflex® Check Valves appear to be a simple rubber valve manufactured in a duckbill shape. However, for each Tideflex® Check Valve there can be hundreds of layers of various natural and synthetic elastomers and fabric-reinforced plies. This allows us to design for drastically different characteristics such as resilience, durometer, compression set resistance, tensile strength and elongation. Each Tideflex® Check Valve is customized to meet your specific hydraulic needs.

Tideflex® Technologies has conducted an extensive amount of Finite Element Analysis (FEA) models to analyze the stress, strain, force and deflection characteristics under many load conditions. Modeling was run for discharging and back pressure conditions. These results were used in developing detailed fabrication protocols so that Tideflex® Check Valves will withstand all of the long-term variable load conditions, while producing the desired hydraulic characteristics.



A Finite Element Analysis model of a Tideflex® Check Valve.

Hydraulic Variations

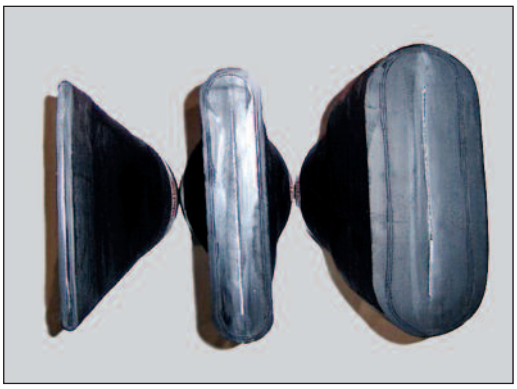
With the extensive amount of data collected, Tideflex® Technologies develops modeling programs which allow us to select the optimal check valve for your unique application needs. Tideflex® Check Valves are not “one size fits all.”

There are up to fifty different variations of check valves within each nominal size. Each variation has its own hydraulic characteristics for headloss, jet velocity, effective diameter and backpressure rating. This is achieved by changing the geometry and relative stiffness of the valve.

Various configurations of Tideflex® Check Valves and Diffuser Nozzles.

Tideflex® Check Valves are constructed similar to a truck tire with many types of elastomers and fabric-reinforced plies. Each material has a different mechanical property. When combined into a unibody construction these materials produce specific hydraulic characteristics.

Only Tideflex® Technologies has performed extensive hydraulic testing and backpressure testing to correlate the specific construction details with the hydraulic performance and back pressure rating of each valve.



Various configurations of Tideflex® Check Valves showing different bill thickness.

Tideflex® Technologies

Curved Bill Does Not Hinder Ability to Open

The Curved Bill design of Tideflex® Technologies' Check Valves will not hinder or effect the ability of the valve to open and close, especially in areas where there is sand or silt present.

Recently a major Regional Council in Queensland, Australia, installed three different sized Curved Bill Tideflex® TF-1 Check Valves along their coastline. Areas along this coastline deal with low-lying land, tidal inlets, sand drifts, high tides and cyclonic rainfall. This means that stormwater drainage outlets are often submerged or buried, making it difficult to ensure stormwater drainage and discharge to the ocean.

The Council said that while there is little that can be done when high tides are occurring to allow stormwater to dissipate (apart from detention basins), Tideflex® Check Valves can be used to stop salt water from inundating low lying areas. The Council also stated the following in regard to the Tideflex® Check Valve:

> "They also do not get blocked, allowing stormwater to be used to clear away sand when the outlet is buried. There are a number of problems with many traditional stormwater outlets which include being buried by sand with tidal drift causing stormwater flooding, allowing saltwater intrusion into the stormwater drainage system and inundating low lying land. This results in immediate and long term damage."

Tideflex® Check Valves can withstand over three metres of inward pressure and do not allow salt water to enter. **The Curved Bill does not restrict valve operation.** A Tideflex® Check Valve can be buried in the sand and will allow stormwater to discharge by using the stormwater pressure to clean away the sand. The valve will flow with as little as fifty millimetres of differential water in the pipe.

The Council also stated the following about the recently installed Tideflex® Check Valves:

> "With the moderate rainfall received recently, we witnessed them [Curved Bill Tideflex® TF-1 Check Valves] working to remove the sand surrounding the buried valves to allow the water to discharge to the ocean. Previously this has taken a crew and backhoe a number of hours to free the water each time it has either rained or been buried. This is just another example of working smarter and using best practice."

Views of the TF-1 Check Valves installed along the coastline. Note that the Curved Bill design of the Check Valves does not hinder the valve's ability to open and flow in the sand.

THE TIDEFLEX® ADVANTAGE

Still Ahead of the Curve!

Curved Bill Design

As part of Tideflex® Technologies' commitment to continuous testing and design improvement, our check valves now feature a patented Curved Bill as standard on Series TF-1/35-1 and as an option on our other check valve products.

The Curved Bill is more resilient. This reduces headloss across the valve and increases sealing. As a result, the Curved Bill returns to a closed position more naturally when compared to the original Straight Bill Tideflex® Check Valve design.

The Curved Bill design increases the sealing area by 50%. This allows the valve to form a tighter seal around debris and solids typically found in stormwater and effluent discharge, airport and highway runoff, CSO/SSO systems, ocean outfalls, flood control systems and pumping stations.

The Curved Bill enhancement is self-draining and does not increase headloss. In fact, headloss is significantly lower with a Curved Bill.

The TF-1 is self-draining and does not increase headloss.

The Curved Bill of the TF-1 seals tightly around debris.

TESTIMONIAL FROM THE FIELD...

"City of Monongahela has worked with Red Valve Company for the past 12 years identifying key locations in our system where absolute back flow prevention is required. Many of our outfall lines are at normal pool elevations or lower. The Tideflex® Check Valves are used specifically to prevent river water from getting into our combined sewer overflow system. By mitigating inflow and infiltration, we are able to prevent back flow, eliminate having to treat clean river water, and we have expanded the capacity of our collection system.

Recently, City of Monongahela has converted from using the original Tideflex® Check Valve (TF-2) to the TF-1 new Eccentric Style with the curved bill. We have found that the eccentric valves have lower headloss and the curved bill provides a more effective seal because of its significantly larger sealing area.

Tideflex® Check Valves have become an integral part of our regional conveyance projects and have saved us money with reduced maintenance and operational costs."

Ed White

Plant Superintendent
City of Monongahela Sewage Treatment Plant

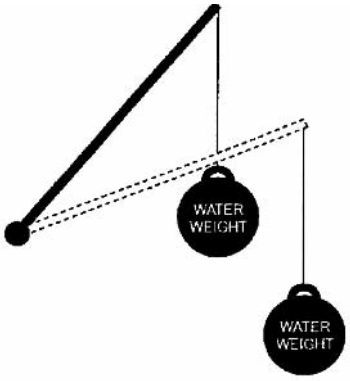
Tideflex® Technologies

Eccentric TF-1 Check Valve Geometry and Improved Structure

More than ten years before the original TF-2 Check Valve patent had expired, the Eccentric TF-1 Check Valve was introduced because it is stronger, has less headloss and addresses the needs of installations with minimal bottom clearance.

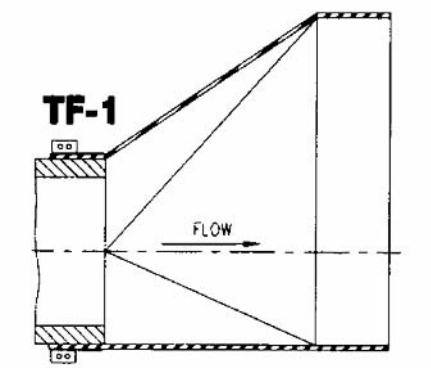
Our most significant technological advancement occured when Tideflex® Technologies tested, patented and introduced the Eccentric TF-1 Check Valve.

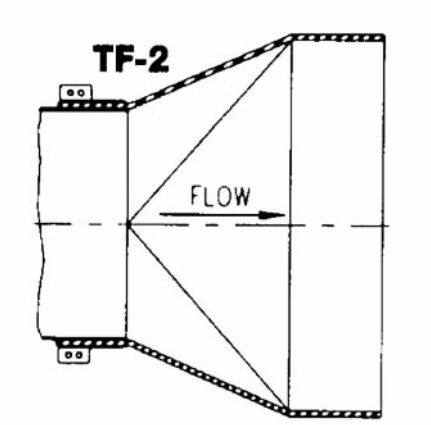
Whether slip-on or flanged, Eccentric TF-1 Check Valves are cantilevered when installed at the end of a pipe, flange or headwall. Only the Eccentric TF-1 is able to withstand the weight of the valve and the weight of water inside the valve with significantly less deflection.



The cantilever spine of the TF-1 supports greater weight than the TF-2 design.

The TF-1's eccentric geometric design and increased spine angle maximize the structural integrity and performance of the valve. As a result, the eccentric TF-1 has been proven to deflect 30-40% less than the TF-2, minimizing the possibility of sagging. The potential for sagging is significant considering the total weight of the valves and water.





The TF-1 spine is at a greater angle, reducing the cantilever effects of water weight

PARTS AND WATER WEIGHTS

VALVE SIZE	TF-1 WEIGHT POUNDS	WATER WEIGHT POUNDS	TOTAL WEIGHT POUNDS	TOTAL WEIGHT TONS
24"	130	637	767	0.3
30"	220	1072	1292	0.6
32"	300	1380	1680	0.7
36"	560	1801	2361	1.1
42"	800	2702	3502	1.6
48"	1027	3855	4882	2.2
60"	1660	7556	9216	4.1
72"	2620	13968	16588	7.4
84"	3880	18411	22291	10.0
90"	4664	23030	27670	12.4

THE TIDEFLEX® ADVANTAGE

Still Ahead of the Curve!

- Independent Hydraulic Testing
- Curved Bill Design Enhances Sealing
- Significantly Lower Headloss
- Improved Structural Integrity
- Eccentric Flat-bottom Design
- Less Bottom Clearance Required
- Increases Flow Capacity

The Eccentric Tideflex® TF-1 Check Valve is the preferred check valve for outfalls. Designed for in-structure and end-of-pipe configurations, the TF-1 features a flat bottom and a flared top. This allows the check valve to be installed at a lower overall elevation compared to other configurations because less bottom clearance is required. This is especially important in low-lying areas where maintaining as much driving head as possible is critical, or where silt, sand and debris might collect beneath the valve.

The Eccentric TF-1 Check Valve is ideal for applications such as junction boxes, diversion chambers and interceptors where the invert of the pipe is close to the floor of the vault. These structures are designed to maximize the available gravity head, thus the pipe invert is as close to the floor as possible. The TF-1 allows installation in existing structures without the need to break up the concrete floor to achieve bottom clearance. For new structures, construction costs are reduced because the required depth is minimized.

The Eccentric TF-1 Check Valve is designed to accommodate installations with little ground clearance.

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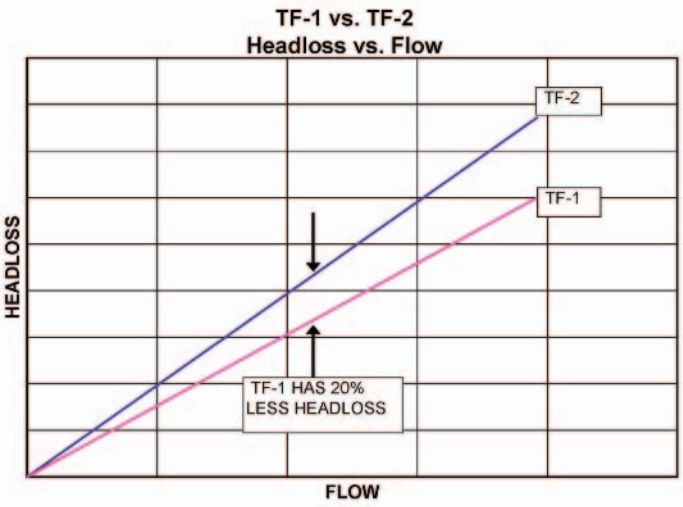
Increased TF-1 Bill Height Reduces Headloss

With a maximized Bill Height that increases the effective open area, headloss in the Eccentric TF-1 Check Valve is significantly reduced. This unique feature improves flow capacity.

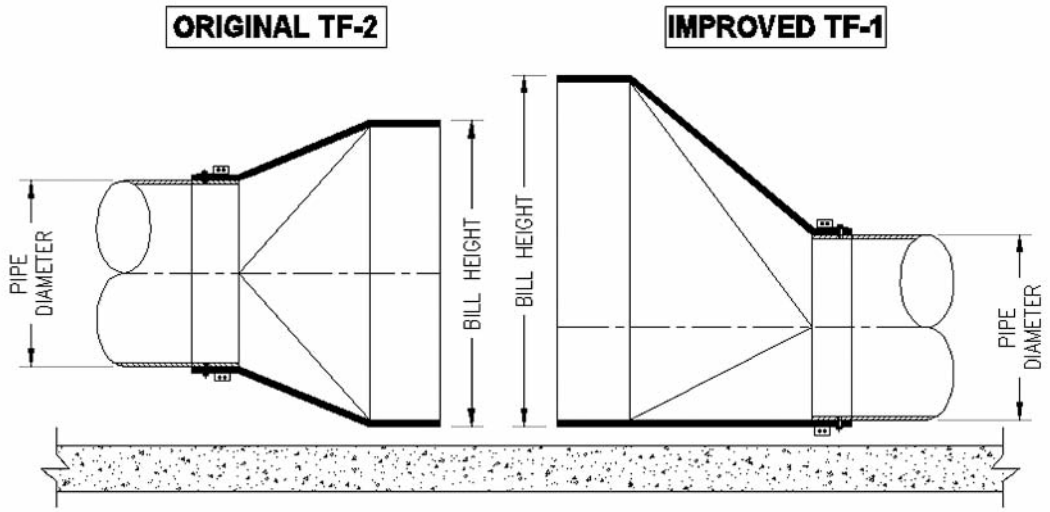
To properly specify an Eccentric TF-1 Check Valve you must state the minimum valve height requirement.

Efficiencies are gained and costs are reduced in gravity outfalls and pumped applications. These savings are derived from the larger effective area of the TF-1 and its increased Bill Height. Systems most impacted are:

- CSO/SSO Systems
- Stormwater Outfall
- Wetlands
- Highway Run-off
- Effluent Discharge
- Flow Equalization
- Retention Ponds
- Levees
- Site Drainage



VALVE SIZE	TF-2 HEIGHT	TF-1 HEIGHT	HEIGHT DIFFERENCE	TF-1 HEADLOSS REDUCTION
12"	20"	23"	3"	32%
24"	39"	43"	4"	21%
36"	63"	70"	7"	23%
54"	80"	90"	10"	26%
90"	124"	145"	21"	36%



Ecccentric TF-1 Check Valves have a greater bill height which increases the effective open area and reduces headloss.

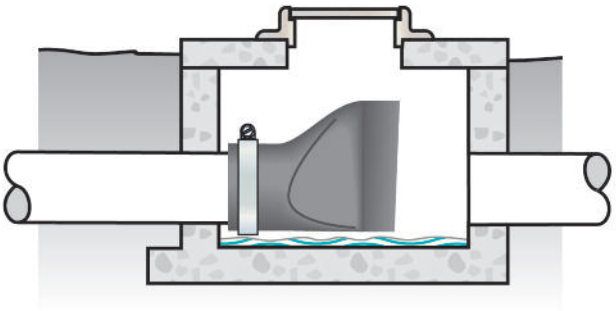
THE TIDEFLEX® ADVANTAGE

Still Ahead of the Curve!

Increases Flow Capacity

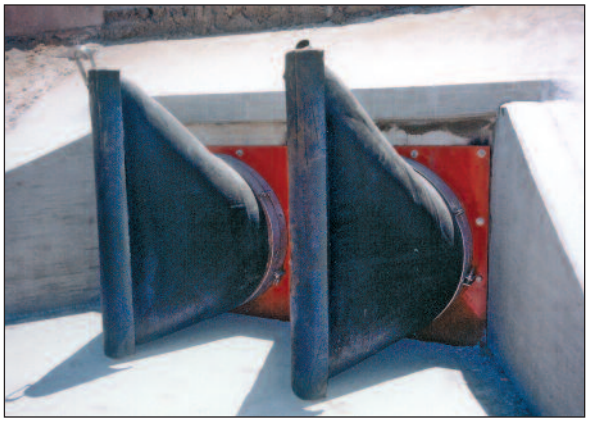
The eccentric TF-1 Check Valve was developed with a flat bottom to minimize the amount of bottom clearance required below the pipe invert. This allows for the valve and pipeline to be lowered, which maximizes driving head. This results in faster drainage, which is especially important in low-lying areas that have limited head available.

In structures, the eccentric TF-1 Check Valve does not require as much clearance below the pipe invert which minimizes the amount of debris, sand and sediment that can get trapped.

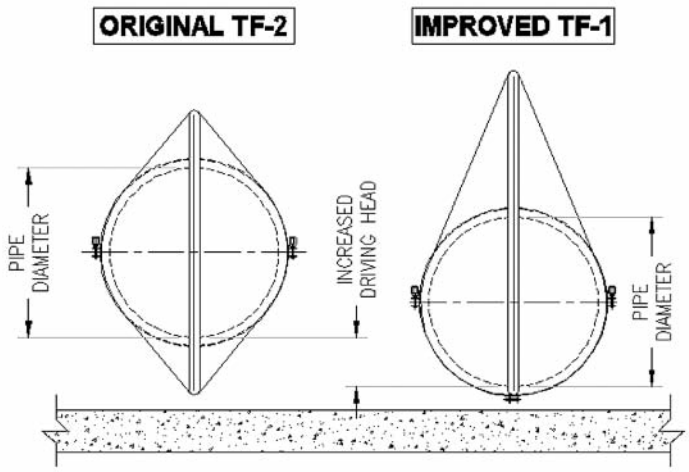


The Eccentric TF-1 produces a very small sump because of its low bottom clearance. The amount of sand and sediment that can get trapped in the vault is minimized because normal flow velocities will scour the sump of a TF-1.

VALVE SIZE	TF-2 HEIGHT	TF-1 HEIGHT	TF-1 INCREASED DRIVING HEAD
12"	20"	23"	4"
24"	39"	43"	7.5"
36"	63"	70"	13.5"
48"	80"	95"	16"
90"	124"	145"	17"



Eccentric TF-1 Check Valves are ideal for low-lying areas.



Eccentric TF-1 Check Valves allow for a lower pipe invert elevation.

The increased driving head of a TF-1 Check Valve improves flow capacity.

Tideflex® Technologies

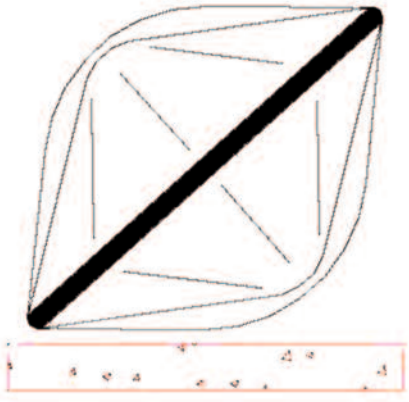
Don't be Fooled by Other Manufacturers

To gain bottom clearance when installing rubber "duckbill" valves, other manufacturers will compromise your design and installation by wrongfully advising you that their valves can be rotated up to 45° from vertical. In sizes 12" and larger, all valves that are installed in a rotated position will distort, gap open and leak. Most importantly, any rotation compromises the structural integrity of the valve due to an unequal distribution of valve and water weight.

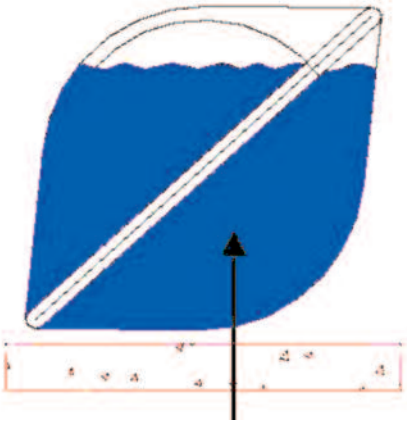
Rotating the bill from vertical causes the valve to gap open which results in the valve not being able to seal properly and prevent backflow. Also, considerable distortion of the bill and valve occurs from buoyancy effects on the projected surface area of the rotated bill, resulting in leakage.

The eccentric TF-1 Check Valve's flat bottom design allows us to keep the bill in the vertical position and eliminate the possibility of the check valve distorting and gapping open.

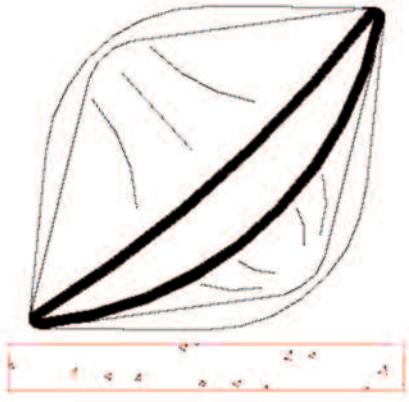
Rotating a check valve will result in distortion, gapping and leakage.



Rubber "duckbill" check valve rotated to gain bottom clearance.



Valve weight + water weight results in excessive load on bottom part of valve.



Top part of valve will not deflect as much as the bottom, resulting in the valve gapping open.

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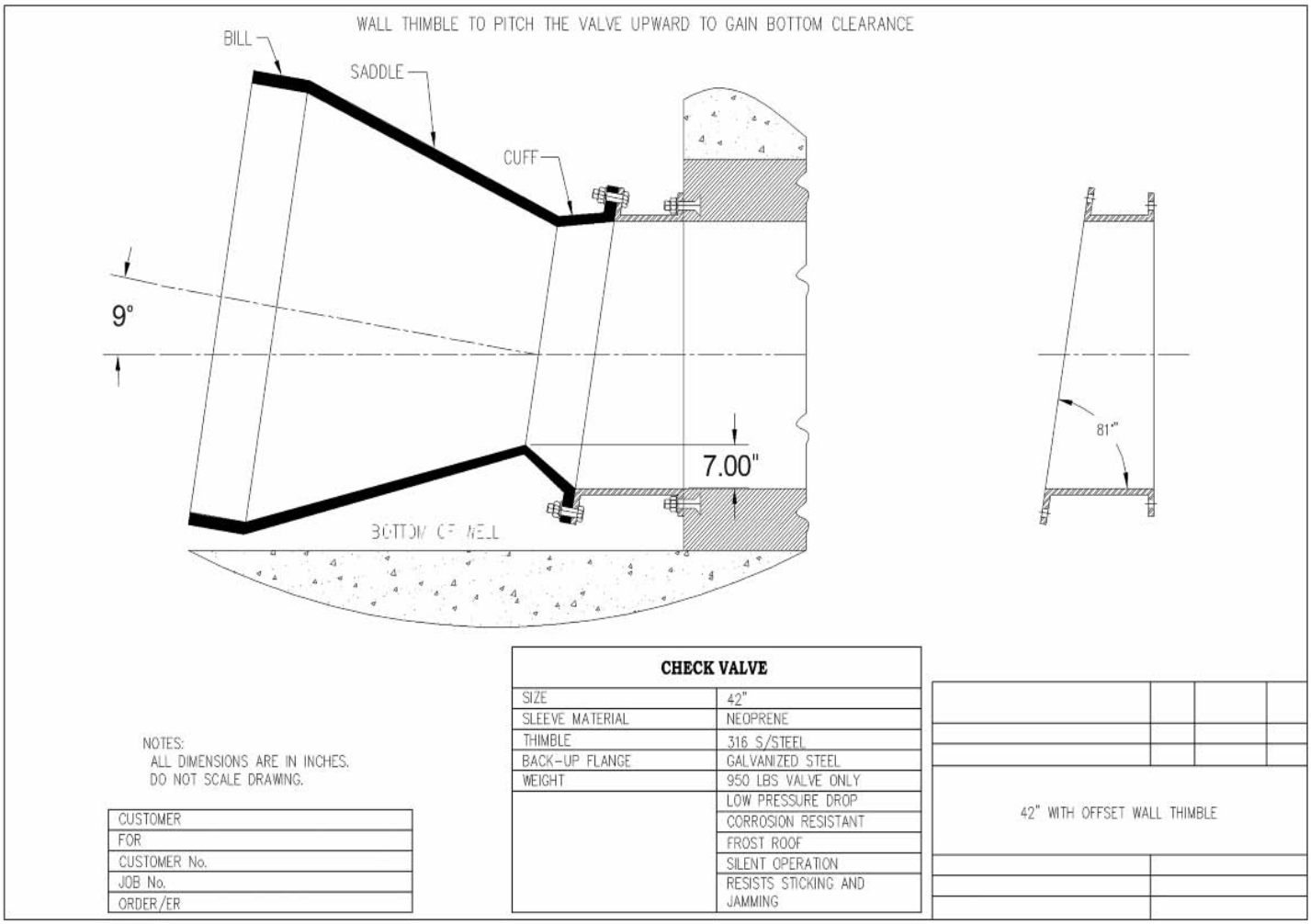
Dangers of Altering the Pipe Pitch

Another tactic used by other manufacturers is to recommend installing non-eccentric duckbill valves using methods that change the pitch of the pipe, as shown in the illustration below. The invert of the pipe has been raised. This will rob available driving head.

The below drawing is of a proposed 42" check valve installation offered by another manufacturer. The most significant problem with this installation is there is a 9° angle at the cuff, which raises the invert 7". Driving head is therefore reduced by 7". For example, if the application has a total upstream elevation change of 3 feet (a driving head of 3 feet) the head pressure is reduced 20%.

Not only does pitching the check valve create greater headloss, it also allows for standing water to collect inside the pipeline. Standing water will collect and stagnate, at the cuff and where the saddle meets the bill. The saddle angles downward past the cuff, which will also trap sedimentation and debris.



Changing the pitch of a pipe will rob available driving head.

Tideflex® Technologies

Reducing Cuff Adapters Increase Headloss

In applications where Reinforced Concrete Pipe (RCP) is specified, it is essential to understand the impact of the different style valve configurations available. Each option has different effects on price and system performance.

If the determining factor when specifying a Tideflex® Duckbill Check Valve is to keep headloss to a minimum, then your specifications must call for a full-size valve built to fit over the pipe O.D. This ensures the maximum flow capacity at the lowest possible headloss.

Duckbill valves with a reducing cuff, as pictured on the right, have appreciably greater headloss because the valve and its bill height are physically smaller. This alternative is less expensive because the valve uses less material and takes less time to manufacture.

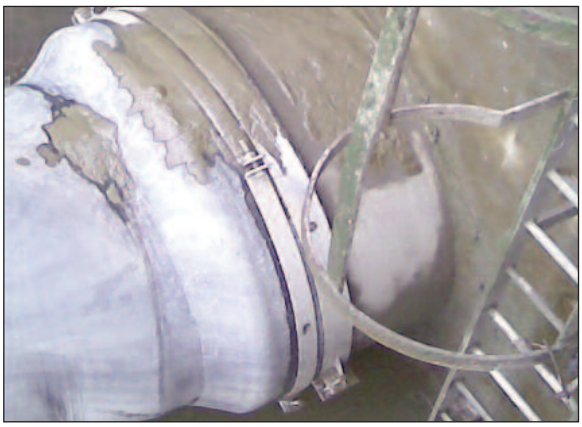
Unless specified otherwise, the standard offered by competing duckbill manufacturers is to provide a smaller duckbill valve with a reducing cuff.

NOMINAL PIPE I.D.	RCP O.D.	TF-1 HEIGHT BASED ON PIPE I.D.	TF-1 HEIGHT BASED ON PIPE O.D.	HEADLOSS REDUCTION	APPROX. PRICE DIFFERENCE
12"	16"	23"	30"	**41%**	20%
24"	30"	44"	55"	**36%**	20%
30"	37"	55"	70"	**38%**	20%
48"	58"	81"	90"	**19%**	20%

The pictures below show several competitor's standard duckbill check valves. Their valves are sized and priced based on nominal pipe I.D., rather than the O.D. of the RCP.

Competitor A

Competitor B



Competitor C

THE TIDEFLEX® ADVANTAGE

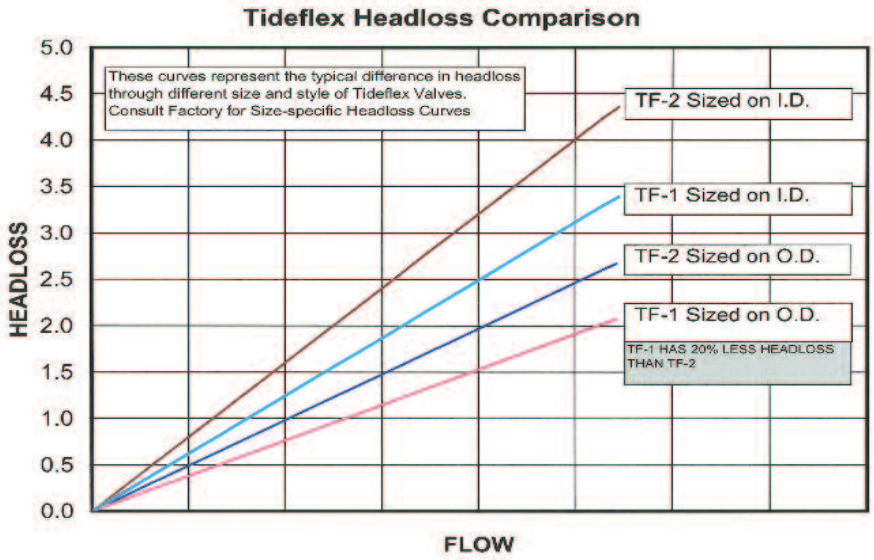
Still Ahead of the Curve!

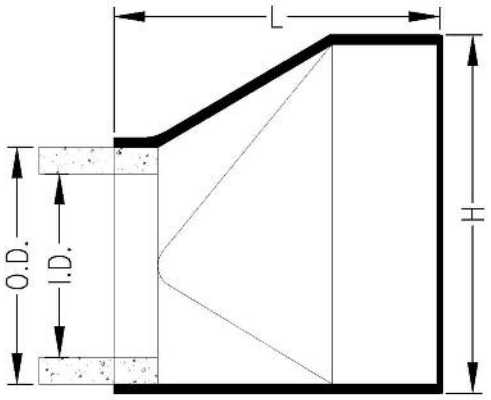
Check Valve Headloss Comparison

In the event that price is more important than headloss, Tideflex® Technologies offers several sizing configurations for Reinforced Concrete Pipe applications.

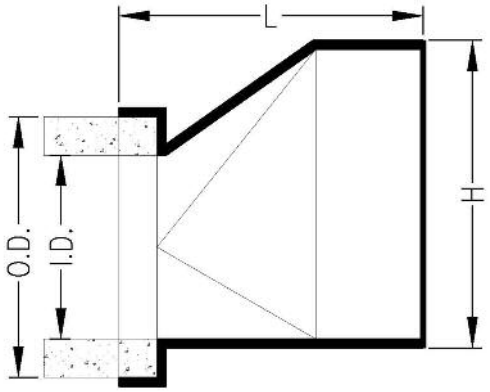
A "representative" headloss chart of the various Tideflex® Check Valve configurations and the hydraulic impact of each option is shown on the right.

The diifferent check valve configuration styles are illustrated below.

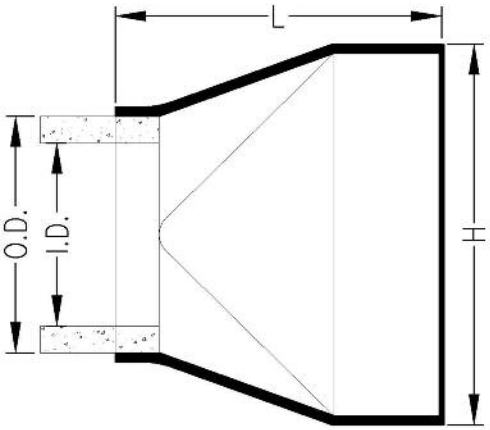




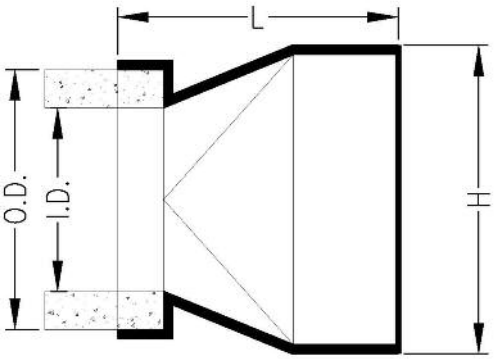
TF-1 Sized on Pipe O.D.



TF-1 with Reducing Cuff Sized on Pipe I.D.



TF-2 Sized on Pipe O.D.



TF-2 with Reducing Cuff Sized on Pipe I.D.

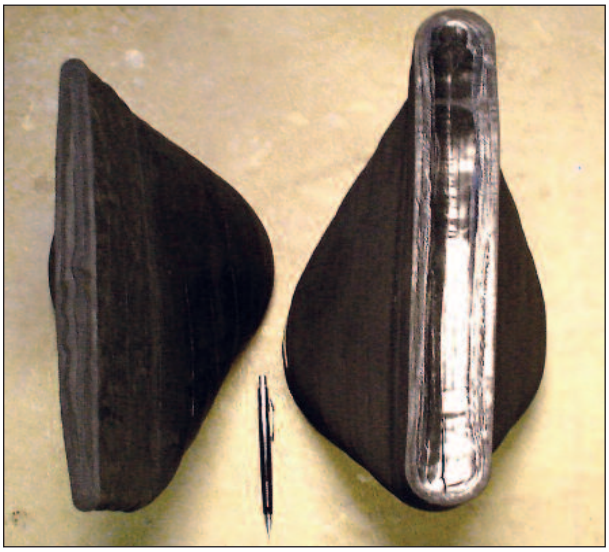
Tideflex® Technologies

Stiffness

Pictured on the right are two 6" check valves made for the same operating conditions. The valve on the left was manufactured by Tideflex® Technologies. The valve on the right was made by another valve manufacturer. These check valves were supplied for the same hydraulic conditions. Tests showed that the other manufacturer's valve had three times the headloss as that of the valve manufactured by Tideflex® Technologies.

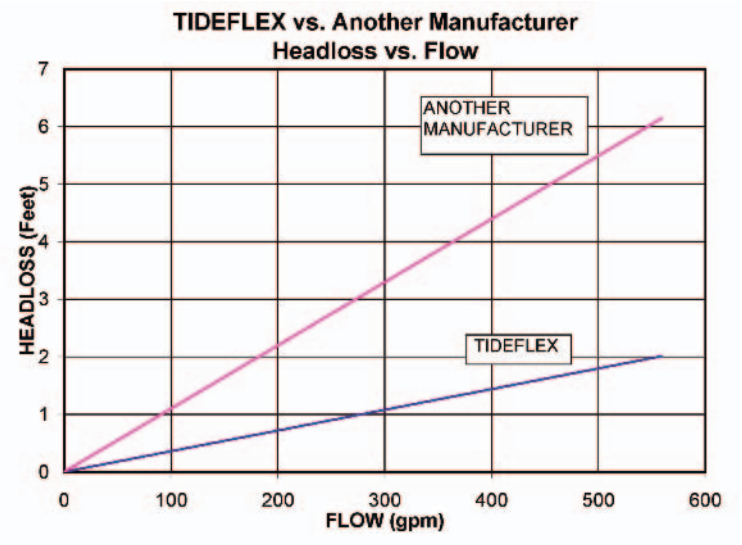
Mandrels

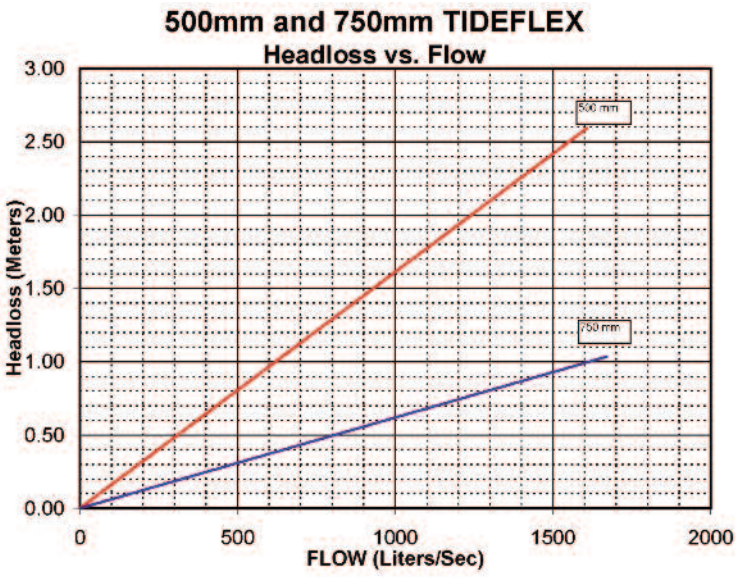
Tideflex® Technologies owns mandrels from 1/2"-96". This allows us to build full-sized valves every time. Other valve manufacturers construct undersized duckbill check valves due to limited tooling. They will then pass the smaller duckbill check valve off as a larger sized valve by simply providing a reducing cuff adapter. This has detrimental effects on the system hydraulics and performance because **undersized valves put additional headloss on the system.**



A Tideflex® Check Valve (left) next to a competitor's check valve (right).

A 20" check valve with a 30" cuff, built by another check valve manufacturer. This was passed off as a 30" check valve.





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THE TIDEFLEX® ADVANTAGE

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Understand the Difference

Tideflex® Check Valves are designed and manufactured in accordance with your hydraulic requirements. Based on our extensive testing and experience, Tideflex® Technologies provides full-sized valves that ensure the greatest flow capacity at the lowest headloss.

Because of insufficient tooling, desire to reduce their cost and to get around your specifications; other manufacturers are willing to supply undersized valves with no regard to your hydraulic requirements.

This results in increased headloss, decreased flow capacity, raised invert elevation, ponding water in the pipe, entrapment of sediment and debris and valves that are prone to inversion.

The Significance of Writing a Proper Specification

Make sure you get what you are entitled to. This document compiles Tideflex® Technologies' 25-plus years of leadership and experience in the check valve industry. Our purpose is to clearly explain the technical advantages of Tideflex® Technologies' Check Valves. All of our check valves have been independently tested and field validated. We also continuously conduct research and development in order to introduce improvements to our check valves.

Our objective is to extend check valve life while improving hydraulic performance. Most importantly, we minimize headloss across check valves.

The information presented in this document is meant to provide technical justification as to why it is important to follow our lead and write a proper specification.

(13) 90" Tideflex® Check Valves installed in the Buenos Aires, Argentina, drainage system.

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Series TF-1 Check Valve Specification

PART 1: GENERAL

1.01 SUBMITTALS

A. Submit product literature that includes information on the performance and operation of the valve, materials of construction, dimensions and weights, elastomer characteristics, flow data, headloss data, and pressure ratings.

B. Upon request, provide shop drawings that clearly identify the valve dimensions.

C. Upon request, manufacturer shall provide installation and reference lists for existing valves of similar size and type to the project scope.

1.02 QUALITY ASSURANCE

A. Supplier shall have at least fifteen (15) years experience in the manufacture of "duckbill" style elastomeric valves.

B. Manufacturer shall have conducted independent hydraulic testing to determine headloss and jet velocity characteristics on a minimum of eight sizes of duckbill valves ranging from 2" through 48". The testing must include multiple constructions (stiffness) within each size and must have been conducted for free discharge (discharge to atmosphere) and submerged conditions.

C. Manufacturer shall have conducted an independent hydraulic test where multiple valves (at least four) of the same size and construction (stiffness) were tested to validate the submitted headloss characteristics and to prove the repeatability of the manufacturing process to produce the same hydraulic characteristics.

D. Manufacturer to have conducted Finite Element Analysis (FEA) on various duckbill valves to determine deflection, stress and strain characteristics under various load conditions. Modeling must have been done for flowing conditions (positive differential pressure) and reverse differential pressure.

E. Valves 24" and larger must incorporate a metallic support completely encapsulated in the wall thickness at the top portion of the valve to assist in supporting the weight of the valve.

F. The bill slit of the duckbill valve must be at least 1.57 times the nominal pipe diameter.

PART 2: PRODUCTS

2.01 "DUCKBILL" ELASTOMERIC CHECK VALVE

A. Check Valves are to be all rubber of the flow operated check type with a slip-on connection. The Check Valve is designed to slip over the specified pipe outside diameter and attached by means of vendor furnished stainless steel clamps. The port area shall contour down to a duckbill, which shall allow passage of flow in one direction while preventing reverse flow. The valve shall be one piece rubber construction with nylon reinforcement. The duckbill shall be offset so that the bottom line of the valve is flat, keeping the invert of the pipe parallel with the invert of the valve. The top of the valve shall rise to form the duckbill shape. The bill portion shall be thinner and more flexible than the valve body and formed into a curve of 180°.

B. Manufacturer must have available flow test data from an accredited hydraulics laboratory to confirm pressure drop data. Company name, plant location, valve size and serial number shall be bonded to the check valve.

2.02 FUNCTION

A. When line pressure inside the valve exceeds the backpressure outside the valve, the line pressure forces the bill of the valve open, allowing flow to pass. When backpressure exceeds the line pressure, the bill of the valve is forced closed. The flat bottom allows the valve to be installed where minimal bottom clearance exists.

2.03 MANUFACTURER

A. All valves shall be of the Series TF-1 as manufactured by Tideflex® Technologies, Carnegie, PA 15106. All valves shall be manufactured in the U.S.A.

PART 3: EXECUTION

3.01 INSTALLATION

A. Valve shall be installed in accordance with manufacturer's written Installation and Operation Manual and approved submittals.

3.02 MANUFACTURER'S CUSTOMER SERVICE

A. Manufacturer's authorized representative shall be available for customer service during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.

B. Manufacturer shall also make customer service available directly from the factory in addition to authorized representatives for assistance during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.

THE TIDEFLEX® ADVANTAGE

Still Ahead of the Curve!

Tideflex® Check Valve Design Data Sheet

I. General Information

Project Name:	Advertises On:
Project Location:	Bids On:

End User's Company Name:		Consulting Engineer Firm:	
Contact:		Contact:	
Email:		Email:	
Address:		Address:	
Address:		Address:	
City:	State:	City:	State:
Zip:	County:	Zip:	County:
Phone:	Fax:	Phone:	Fax:

II. Flow Condition

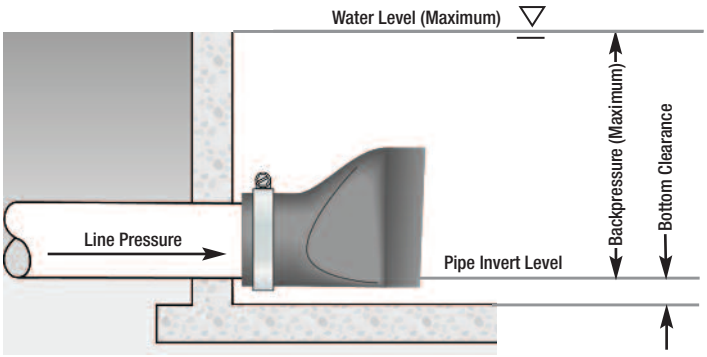
☐ Stormwater/Drainage	☐ Sewage	☐ CSO/SSO	☐ Other:			
☐ Pumped	☐ Gravity Flow					
Line Pressure (Required for Pumped Systems) -	Minimum:	Maximum:	feet ☐	meters ☐	psi ☐	bar ☐
Flow Rate -	Minimum:	Maximum:		gpm ☐	lps ☐	
Maximum Backpressure (Calculated to Pipe Invert Level):			feet ☐	meters ☐	psi ☐	bar ☐
Bottom Clearance (Distance Beneath Pipe Invert):				inches ☐	mm ☐	

III. Pipe Details

☐ Inches ☐ mm
Nominal Pipe Size:
Pipe O.D.:
Pipe I.D.:
Pipe Material:

IV. Curved Bill Option

☐ Yes ☐ No
Curved Bill is Standard on TF-1 and Series 35-1 Check Valves Size 18" and Larger



V. Installation Options

Slip-on a Pipe:	☐ TF-1	☐ TF-2
Flange Installation:	☐ Series 35-1	☐ Series 35 ☐ 39/39F
Drilling:	☐ ANSI 125/150 #	☐ PN_____
Slip-inside a Pipe:	☐ Series 37 (Flanged)	☐ Series 37G (Insert)
Wall Thimble Required: (If Yes, Provide Detail Drawing of Structure/Headwall)	☐ Yes	☐ No

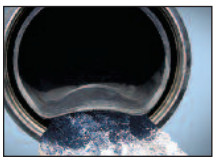
Comments:

Tideflex® Technologies

Tideflex® Technologies offers a full line of check valves and engineered systems for water mixing, aeration and effluent diffusers.

NEW CHECKMATE™ INLINE CHECK VALVES

The custom-engineered, all-rubber unibody design of the CheckMate™ Inline Check Valve eliminates costly backflow. The valve has very low headloss, which is especially beneficial in low-lying areas.



INLINE CHECK VALVES

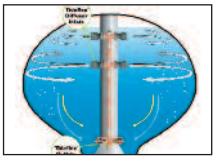
Designed with the Tideflex® Check Valve, the Series 39, 39F, 4739 and 4739-R provide maintenance-free backflow prevention. Available in sizes to 96".

AERATION SYSTEMS

Tideflex® Diffused Aeration Systems utilize backflow prevention technology to provide a maintenance-free system. Fine bubble, coarse bubble and combination aeration systems are available.

RESERVOIR MIXING SYSTEMS

The Tideflex® Mixing System improves water quality in finished water storage tanks and reservoirs of any size or style. The custom engineered systems prevent short-circuiting, stagnation, thermal stratification and optimize mixing.



EFFLUENT DIFFUSER SYSTEMS

Tideflex® Effluent Diffusers prevent intrusion of debris, sediment, saltwater and aquatic life into outfall lines while optimizing diffuser hydraulics.

WATERFLEX® CHECK VALVES

The unique wafer-thin elastomer Waterflex® Check Valve provides reliable backflow prevention with no moving parts that require maintenance or repairs. Available in sizes to 96".

Tideflex® Curved Bill
Patent # 5,727, 593.

Tideflex® TF-1 Check Valve
Patent # 5,931,197.

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