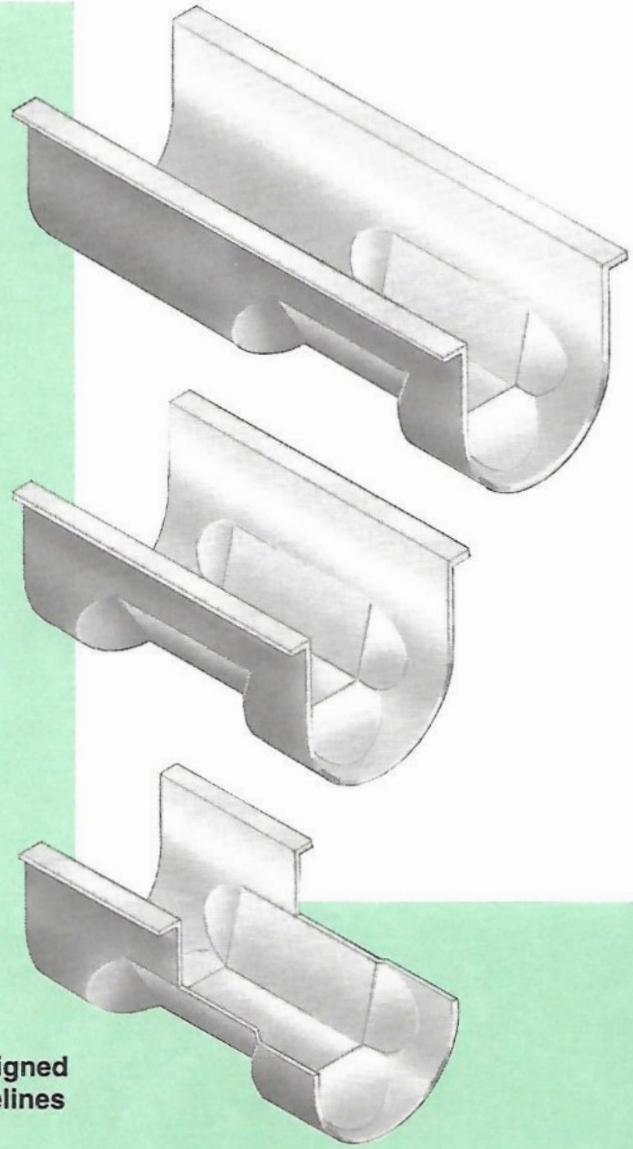
ENGINEERED FIBERGLASS COMPOSITES INC.

FIBERGLASS REINFORCED POLYESTER PALMER-BOWLUS FLUMES



High quality Palmer-Bowlus flumes designed for use in the metering of liquids in pipelines and round bottom open channels.

Corrosion resistant materials of construction for long life.

Molded one-piece construction for high strength and rigidity.

Smooth gelcoat finish on interior surface to reduce friction and debris build-up.

Light weight (vs other materials of construction) for ease of installation.

Available in the permanent type, insert (or invert) type and exit (or cutback) type.

Numerous optional equipment items are available for use with flow meter.

Sizes available from 4" through 48".

Fast delivery on most sizes.

ENGINEERED FIBERGLASS COMPOSITES INC.
PALMER-BOWLUS FLUMES

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CONSTRUCTION DATA, CHARACTERISTICS AND FEATURES

The Palmer-Bowlus flume is a particular type of the venturi flume which was developed in the 1930's by Harold V. Palmer and Fred D. Bowlus. The Palmer-Bowlus flume was designed to meter liquids in pipelines and round bottom open channels, typically within a manhole, where free flow conditions are present. The Palmer-Bowlus flume is essentially a restriction in the channel designed to produce a higher velocity critical flow in the throat.

The advantages of the Palmer-Bowlus flume include minimal restriction to flow, low energy loss, accuracy of measurement (comparable to the Parshall flume), low cost and ease of installation.

A number of different cross-sectional shapes are possible for the Palmer-Bowlus flume. EFC and most manufacturers fabricate the flumes having the trapezoidal shape. The trapezoidal throat with flat bottom has the least constriction through the flow area and provides for minimum head loss. The trapezoidal configuration provides better accuracy at both low flow and peak capacity maximum flow.

EFC Palmer-Bowlus flumes are well suited for measurement of liquids containing solids that settle under gravity head conditions. The smooth interior surface and unbroken flow lines prevent debris build-up and create low head loss.

EFC Palmer-Bowlus flumes are of molded one-piece construction consisting of the upper transition, throat and lower transition sections. The flumes are fabricated with polyester resin, reinforced with glass fibers (minimum 30% content by weight), having a minimum overall wall thickness of $^3/_{16}$". The interior surface has a smooth white isophthalic gelcoat finish containing U.V. inhibitors.

EFC Palmer-Bowlus flumes are provided with integral $2^1/_2$" wide top flanges for rigidity and stability. Pultruded fiberglass spreader bars (tie bars) are provided across the top flanges to maintain the flume's dimensional characteristics during shipment, installation and operation.

EFC Palmer-Bowlus flumes have the following characteristics:

- High strength
- Corrosion resistant
- Dimensionally accurate
- Light weight
- Easy installation
- Economical
- Virtually maintenance free

EFC Palmer-Bowlus flumes are available in three types;
Permanent type Palmer-Bowlus flume
Insert (or invert) type Palmer-Bowlus flume
Exit (or cutback) type Palmer-Bowlus flume

PERMANENT TYPE

The permanent type Palmer-Bowlus flume is typically grouted in place between two sections of pipe. Integral fiberglass anchor clips are provided on the sides to help secure the flume in place during installation. The flume can be furnished with end adapters for installations where grouting in place is not practical. The flume can also be furnished with end bulkheads in situations where the flume is smaller than the pipe in which it is to be installed. The permanent type flume is constructed with an integral approach section which provides a smooth transition of the liquid into the flume. Numerous optional equipment items are available for the permanent type flume. The most common items are listed on the back page.

Continued on page 4

CAPACITIES & WEIGHTS

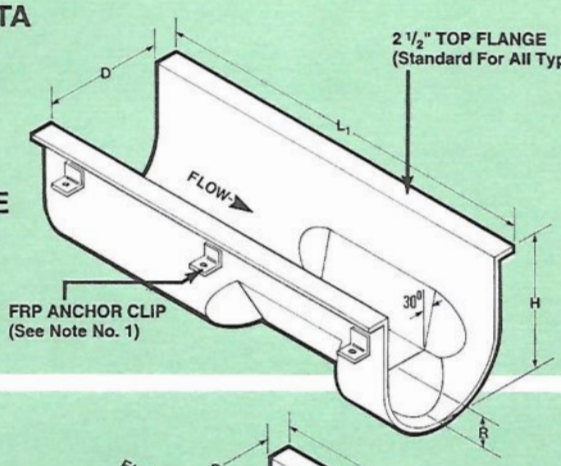
Flume Size (D Dimension)	Approx. Maximum Discharge* CFS	MGD	GPM	Head at Approx. Maximum Discharge	Ship Wgt. Permanent (lb.)	Ship Wgt. Insert (lb.)	Ship Wgt. Exit (lb.)
4"	0.12	0.07	51.9	2.9"	10	6	5
6"	0.34	0.22	152.5	4.5"	15	9	8
8"	0.70	0.45	312.8	6.0"	20	13	11
10"	1.22	0.79	547.2	7.5"	28	19	18
12"	1.92	1.24	862.5	9.0"	38	25	22
15"	3.33	2.15	1494.8	11.2"	60	34	30
18"	5.30	3.43	2378.5	13.5"	80	55	49
21"	7.74	5.01	3475.6	15.7"	130	70	62
24"	10.88	7.03	4880.7	18.0"	165	85	75
27"	14.81	9.57	6646.4	20.4"	210	105	95
30"	19.16	12.38	8597.9	22.6"	280	125	110
36"	29.97	19.37	13451.1	27.0"	440	165	155
42"	43.77	28.29	19645.6	31.4"	570	210	185
48"	58.32	37.69	26171.8	35.0"	730	255	220

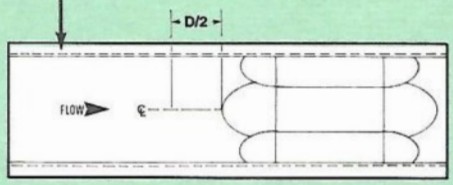
** For permanent type flumes. Insert and exit type flumes average slightly less. Contact EFC for complete head vs. flow discharge tables.*

DIMENSIONAL DATA

PERMANENT TYPE
(Dimensions are inside)
(T_1 = Wall Thickness)

ISOMETRIC VIEW

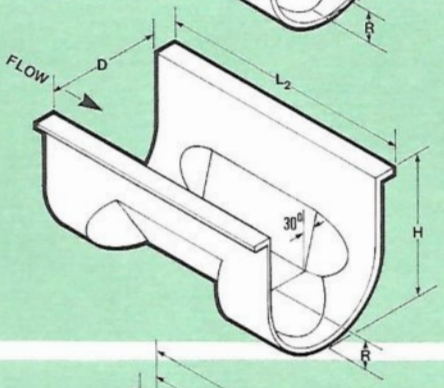


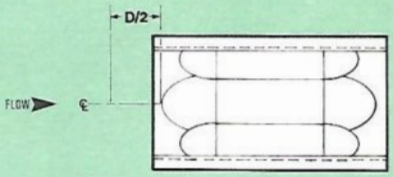


TOP VIEW

INSERT TYPE
(Dimensions are outside)
(T_2 = Wall Thickness)

ISOMETRIC VIEW

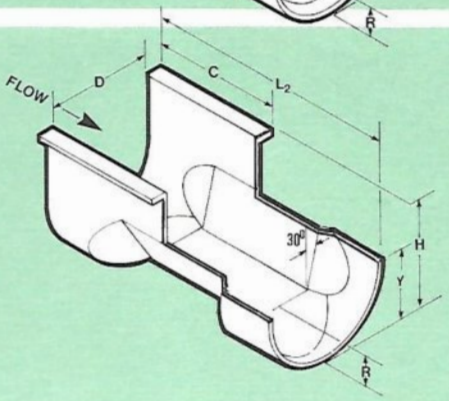


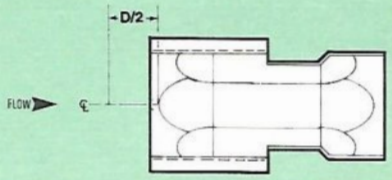


TOP VIEW

EXIT TYPE
(Dimensions are outside)
(T_2 = Wall Thickness)

ISOMETRIC VIEW





TOP VIEW

DIMENSIONAL DATA TABLE

D	D/2	H	R	L_1	L_2	C	Y	T_1	T_2
4"	2"	6"	$^{2}/_{3}$"	17"	10"	$4^{5}/_{8}$"	$1^{13}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"
6"	3"	8"	1"	25"	14"	$6^{5}/_{8}$"	$2^{13}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"
8"	4"	10"	$1^{1}/_{3}$"	33"	18"	$8^{5}/_{8}$"	$3^{13}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"
10"	5"	12"	$1^{2}/_{3}$"	41"	22"	$10^{5}/_{8}$"	$4^{13}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"
12"	6"	14"	2"	49"	26"	$12^{5}/_{8}$"	$5^{13}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"
15"	$7^{1}/_{2}$"	17"	$2^{1}/_{2}$"	61"	32"	$15^{5}/_{8}$"	$7^{5}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"
18"	9"	20"	3"	73"	38"	$18^{5}/_{8}$"	$8^{13}/_{16}$"	$^{3}/_{16}$"	$^{3}/_{16}$"
21"	$10^{1}/_{2}$"	23"	$3^{1}/_{2}$"	85"	44"	$21^{5}/_{8}$"	$10^{5}/_{16}$"	$^{1}/_{4}$"	$^{3}/_{16}$"
24"	12"	26"	4"	97"	50"	$24^{5}/_{8}$"	$11^{13}/_{16}$"	$^{1}/_{4}$"	$^{3}/_{16}$"
27"	$13^{1}/_{2}$"	29"	$4^{1}/_{2}$"	109"	56"	$27^{5}/_{8}$"	$13^{5}/_{16}$"	$^{1}/_{4}$"	$^{3}/_{16}$"
30"	15"	32"	5"	121"	62"	$30^{5}/_{8}$"	$14^{13}/_{16}$"	$^{1}/_{4}$"	$^{3}/_{16}$"
36"	18"	38"	6"	145"	74"	$36^{5}/_{8}$"	$17^{13}/_{16}$"	$^{5}/_{16}$"	$^{3}/_{16}$"
42"	21"	44"	7"	169"	86"	$42^{5}/_{8}$"	$20^{13}/_{16}$"	$^{5}/_{16}$"	$^{3}/_{16}$"
48"	24"	50"	8"	193"	98"	$48^{5}/_{8}$"	$23^{13}/_{16}$"	$^{5}/_{16}$"	$^{3}/_{16}$"

1. FRP anchor clips for permanent type flume are shown on isometric view only.

2. Pultruded FRP spreader bars across top flanges are not shown.

INSERT TYPE

The insert (or invert) type Palmer-Bowlus flume is typically bonded in place with an existing half-section of pipe. The outside radius of the flume should be approximately equal to the inside radius of the pipe in which it is to be installed.

EXIT TYPE

The exit (or cutback) type Palmer-Bowlus flume is typically installed within the discharge pipe of a manhole. The exit (or cutback) type flume is a variation of the insert type flume. This type of flume allows the maximum amount of space for upstream monitoring and sampling.

SIZING/MEASURING POINT

Palmer-Bowlus flumes should be selected by the expected rate of flow rather than strictly by the pipe diameter in which the flume is to be installed. When a flume size is selected which is smaller than the pipe size, the permanent type flume with integral approach section and end bulkheads should be used to smooth out the flow before it reaches the point of measurement.

The preferred head measuring point is at a distance of one-half the "D" dimension upstream from the upper transition section.The depth of the liquid at this point is to be measured from the floor of the throat section (not the bottom of the integral approach section or pipe).

OPTIONS (FOR PERMANENT TYPE)

Embedded staff gauge calibrated in inches and 1/4" increments (standard calibration units) with numbering on each inch increment.

Integral (attached) 12" I.D. fiberglass stilling well (6", 8" and 10" I.D. sizes are also available).

Fiberglass NPT connection for remote stilling well or support pipe bushing (various sizes are available).

Stainless steel support bracket for mounting of level sensor (ultrasonic) instrumentation.

Stainless steel bubbler tube (molded in) with compression fitting for connection to flow meter tubing (various sizes are available).

Molded cavity (recess) in sidewall and/or floor for flush mounting of flow sensing instrumentation.

Fiberglass inlet and outlet adapters for connection to pipeline.

Fiberglass end flanges ($2\frac{1}{2}$" wide standard).

Fiberglass bulkheads for applications where the flume size is smaller than the pipe size.

Nonstandard resin for high temperature or special chemical resistance.

Additional laminate (wall) thickness ("T" dimension).

ORDERING INFORMATION

When ordering please provide the following information:

- ❑ Type of flume (permanent, insert or exit type).
- ❑ Size of flume ("D" dimension).
- ❑ Optional equipment items - include required size and location (if applicable). Please specify location as right or left hand side looking downstream.

If your flume was quoted direct by EFC please advise quotation number. This will greatly reduce the amount of information required during order placement.

SAMPLE SPECIFICATIONS

A_____ inch (permanent) (insert) (exit) type Palmer-Bowlus flume shall be supplied and installed within the pipeline (or channel) as shown on the specification drawings. The flume shall be a molded one-piece unit of fiberglass reinforced polyester construction having a smooth white isophthalic gelcoat finish, free of any irregularities, on the inside surface. Flume shall be provided with fiberglass spreader bars to help maintain the flume's dimensional characteristics during shipment, installation and operation. Integral fiberglass anchor clips shall be provided to help secure unit in place during installation (permanent type only). Flume shall be provided with the following options:

_____

_____

_____

Flume shall be manufactured by Engineered Fiberglass Composites Inc., New Lisbon, WI.

CONTACT EFC FOR OTHER PRODUCT LITERATURE

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