



Flume Installation

Please keep the following in mind when attempting a successful installation:

1. Flow approaching the flume should be smooth with an appropriate inlet transition. There should be no bends, dips, or flow junctions immediately upstream of the flume location resulting in a poorly distributed velocity pattern.
2. Ensure the flume is centered in the flow stream, the floor is not operating under submerged flow conditions, and that the flume floor is level.
 - a. Do not place the level on top of the flume.
3. It is critical the flume's walls and floor be braced internally for proper operation. During install, plywood or lumber can be used to ensure distortion does not occur. For flumes with throat widths of 12 inches [30.48 cm] or larger, this is particularly important. Generally, failure to maintain a flume's dimensions is NOT correctable through adjustment to the flow equation.
4. **The flume must not float out of its intended final position during installation.**
5. All the flow must go through the flume, there should be no bypass.
6. Open channel conditions must always exist.

Photographs of the installation process and the completed installation must be submitted for the full (5) year VPC Fiberglass Warranty.

These photos not only serve to document the installation process used but also help VPC Fiberglass assist in trouble shooting operations that are not performing optimally. The better the pictures (or set of pictures), the better (and more accurate) the service that VPC Fiberglass can provide.

Stiffening Angles

The stiffening angles on the top of the flume are provided to ensure dimensional accuracy. The angles should be **left on the flume** at least until the installation has been completed. If the flume is set in concrete, the angles may be removed on the installation has been completed and the concrete has set.

For installations where the flume is free-standing or otherwise not set in concrete, the angles should be left in place. If the angles are removed, verify the dimensional accuracy of the flume after the removal. Stiffening angles should not be removed for nested flume configurations as modifications to the standard flume construction mean that these flumes are less rigid than standard construction flumes.



Sealing

Flumes supplied with end adapters, bulkheads, or transition sections must remain sealed between the joints. A final visual inspection of all joints and seals should be done before installation - applying one or two continuous beads of silicone on all before proceeding with the installation if necessary. When drilling through the connection flange between a flume, end adapter, or wing wall, seal the penetration.

Couplings

VPC Flumes are supplied with end adapters or bulkheads with pipe stubs, these may be paired with PVC Fernco couplings which seal by compression. During installation, considerable forces (30 psi [206.8 kPal]) may need to be exerted for surface sealing. Installation torque of 60 psi [413.6 kPal] is required for the 5/16" hex screws on the stainless-steel clamps. For elevated temperature applications, the couplings are rated for 140 °F [60 °C] non-constant temperatures. Remember that the couplings are manufactured from flexible PVC and the flow stream must, therefore, be chemically compatible with PVC.

If the coupling installs with little effort or appears loose, stop, and contact Fernco (1.800.521.1283) for assistance. The proper operation of the couplings relies upon the information that you provide at the time of order. It is important that the couplings may not function as intended due to improper or insufficient description of the pipes being connected or changes in pipe dimensions or design. All connections should be tested before backfilling or enclosure.

FLUME ORIENTATION

Parshall Flumes

The flat floor of the flume (the crest) should be set upstream.

- If the throat (control) width is greater than 50% of the channel width, then 10 throat (control) widths of straight approach are required.
- If the throat (control) width is less than 50% of the channel width, then 20 throat (control) widths of straight approach are required.

The inlet of the flume must be set at or above the invert of the inlet channel/pipe. If set higher, a 1:4 slope ramp should be grouted from the channel / pipe to the inlet of the flume. The inlet of the flume should never be below the invert of the channel / pipe.

The outlet of the flume should be set at or above (ideally) the invert of the outlet channel / pipe to help transition solids out of the flume and to minimize the chance of submergence. When transitioning flow out of the flume, the channel should be straight and unobstructed for 5-20 throat widths - although flow spilling off the end of the flume can eliminate this requirement.

Palmer - Bowlus Flumes

The ramp in the floor of the flume should be set downstream.



- Generally, 25 upstream straight run throat widths/ pipe diameters are required upstream.

The inlet channel / pipe should be at (never above) the inlet of the flume. The outlet of the flume should be at or above the invert of the channel / pipe to help transition solids out of the flume and to minimize the chance of submergence.

Flume Size, Inches	Ideal (Maximum) Upstream Slope Percent
4	0.73 (2.2)
6	0.64 (2.2)
8	0.58 (2.0)
10	0.54 (1.8)
12	0.51 (1.6)
15	0.47 (1.5)
18	0.44 (1.4)
21	0.42 (1/4)
24 and above	0.40- 0.30 (1.3 - 1.16)

When transitioning flow out of the flume, the channel should be straight and unobstructed for 5-20 throat widths - although flow spilling off the end of the flume can eliminate this requirement.

Trapezoidal Flumes

The inlet and outlet geometries of Trapezoidal flume are similar. Verify the direction of flow before proceeding. The point of measurement should be upstream.

- If the throat (control) width is greater than 50% of the channel width, then 10 throat (control) widths of straight approach are required.
- If the throat (control) width is less than 50% of the channel width, then 20 throat (control) widths of straight approach are required.

The inlet of the flume must be set at or above the invert of the inlet channel/pipe. If set higher, a 4:1 slope ramp should be grouted from the channel / pipe to the inlet of the flume.

The outlet of the flume should be set at or above (ideally) the invert of the outlet channel / pipe to help transition solids out of the flume and to minimize the chance of submergence. For flumes handling flows less than 3 cfs [84.96 l/s], it is recommended that the outlet of the flume be set 1 inch [2.54 cm] above the invert of the outlet channel / pipe. For flumes handling flows greater than 3cfs [84.96 l/s], it is recommended that the outlet of the flume be set 2 inches [5.08 cm] above the invert of the outlet channel / pipe. The suggest outlet elevation differences are to help transition solids out and away from the flume and to minimize the chance of submergence.

H / HS / HL Flumes



The inlet of the flume (or the approach section) should be set at or above the invert of the inlet channel / pipe.

- ❑ The upstream channel should be straight for at least 3-5 times the maximum anticipated head, H max, upstream of the flume.

The outlet of the flume must be sufficiently higher than the invert of the outlet channel / pipe to ensure unimpeded free-fall out of the flume. H-flumes have little resistance to submergence and free-fall conditions are critical.

Montana (Short Section Parshall) Flumes

The wider section of the trapezoidal shape (when viewed from above) should be set upstream.

- ❑ If the throat (control) width is greater than 50% of the channel width, then 10 throat (control) widths of straight approach are required.
- ❑ If the throat (control) width is less than 50% of the channel width, then 20 throat (control) widths of straight approach are required.

The inlet of the flume must be set at or above the invert of the inlet channel/pipe. If set higher, a 4:1 slope ramp should be grouted from the channel / pipe to the inlet of the flume. The inlet of the flume should never be below the invert of the channel / pipe.

The outlet of the flume must be sufficiently higher than the invert of the outlet channel / pipe to ensure unimpeded free-fall out of the flume. Lacking the throat and discharge sections of the full length Parshall flume, Montana flumes have no resistance to submergence and free-fall conditions are essential.

UPSTREAM CONDITIONS WHEN CONNECTING TO PIPING

For connection of Upstream piping, there should be at least 25 pipe diameters of straight constant slope pipe upstream of the flume. Without this amount, turbulence and non-uniform velocity profiles may exist and affect flow accuracy. We encourage energy absorbers, perforated plates, and tranquilizing racks to aid in the slowing and straightening of the incoming flow.

DOWNSTREAM CONDITIONS

To minimize the chance of the flume becoming submerged, the EPA recommends 5-20 throat widths of straight downstream channel. For most short and long-throated flumes, there is not a minimum recommended downstream condition if it does not back into the flume. There is very little, if any, resistance to submergence for Montana and H-type flumes; applications that involve either flume should ensure flow freely spills out of the flume under all flow conditions.

CONCRETE INSTALLATION

Often, flumes will be installed by grouting into a new or existing channel. Flumes should be installed in channels or vaults that have adequate clearance to allow for proper placement of



group and worker access, generally around 18 inches [45.72] on each side. Larger flumes can be placed on piers that are poured perpendicular to the flow stream or concrete blocks to aid in access during installation.

Utilizing anchor clips on the sides of the flume, you can key the flume into the concrete by securing anchor clips to rebar/wire. Anchor clips should not prevent the flume from shifting during installation and only be used for leveling purposes on small size flumes. To prevent floatation, the flume should be weighted and braced internally. Floor distortion is a concern, particularly for flumes with large, flat bottoms. Make sure to take the necessary steps to avoid distortion before proceeding. Distortion during installation is not warrantable.

When securing the flume in place, flowable grout should be used. The initial lift should be slowly poured from one side to let the grout flow under the flume to the other side, eliminating the possibility of voids under the flume. The bottom of the flume should be covered and extend no more than 6 inches [15.24 cm] up the sidewalls. Allow setting to occur to prevent and deformations, shifts, or unlevel grounds. Once the initial pour has set, grout up the sidewall in 6-10 inch [15.24-25.4cm] lifts, letting each lift set before proceeding. On the top flange of the flume, there is a protective coating to assist in situations of grout being poured on top of a flume. This coating should be removed after the grout has been poured and soothed.

To ensure there are no voids and air pockets in the grout, vibrator sticks or chaining should be used. When using a vibrator stick, be aware that excessive use can distort your flume while failure to eliminate voids may also result in distortion and is not warrantable.

On large flumes, grout one section between piers (or blocks) at a time, letting the grout set before proceeding to the next section. A grout hose may be required due to the distances involved. Flow grout from only one side of the flume.

EARTHEN CHANNEL INSTALLATION

While most flumes are grouted into new or existing channels, they may also be installed in earthen channels (furrows, irrigation ditches, streams, etc). Using the anchor clips secured on the sides of the flume and earth anchors with wire, key the flume into the earthen channel. These clips should be used for leveling purposes on small sized flumes as they are not intended to prevent shifting. Flumes should be installed on a compacted fill base; for install on soggy ground you can utilize heavy timbers in a perpendicular pattern to the direction of flow under each end of the flume and throat. During installation, be sure to brace the flume internally and weight it, as distortion is a concern for large flat bottom flumed. Distortion during installation is not warrantable.

Once the flume has been installed on the prepared base, pack soil against both sides of the flume. The packed soil should extend up the sidewalls to the top of the flume. In earthen channels, localized scouring may occasionally be present near the entrance and will probably be present at the exit of the flume. Ensure that sufficient channel reinforcement is installed once the backfill around the flume has been completed. Upstream scouring can lead to flow bypassing the flume, while downstream scouring can lead to flume settling. As a rule of



thumb, downstream riprap protection should extend not less than 4 times the maximum normal depth of the downstream channel, nor less than 5 feet [1.05 m].