

Lane Reverse Q Pond Outlet Installation and Maintenance Guide

Introduction

The Lane Reverse Q (RQ) Pond Outlet is a unique and extremely cost effective storm water Best Management Practices (BMP), which significantly improves the quality of the storm water being discharged from ponds. In addition, it Reverses the Q, which means that it inverts the normal pattern of deeper pond depths/high discharge to shallower pond/smaller discharge. This results in lower downstream flows at the most critical times when stream and river flows are at their maximum levels. In fact, the RQ discharges the least water when the pond is full and the most water when the pond is almost empty. This is made possible by the unique design of the RQ Lever Arm Assembly, which positions the outlet orifice at different depths, which are the inverse of the depth of the pond.

RQ Outlet Construction

The Lane RQ is made of two basic components, a float body and an outlet lever arm. The float body is made of Smooth Interior Corrugated Polyethylene pipe and HDPE sheet, both of which are protected from UV rays from the sun. The pipe floats are filled with a closed cell U. S. Coast Guard compliant marine grade foam, which ensures the flotation capacity of the float body, even if the float body is damaged. The outlet lever arm is suspended inside the shell of the float body by a polyethylene yoke and a stainless steel bolt. A ¼" thick HDPE orifice plate is attached just inside the atrium grate. The Schedule 40 PVC lever arm transmits water down to a flexible hose, which allows the float body to rise and fall as the pond fills and drains. The flexible hose is attached to another short section of PVC pipe, and then connected to a Fernco flexible adaptor which attaches directly to the outlet pipe.

Figure 1

RQ LEVER ARM AND FLOAT BODY

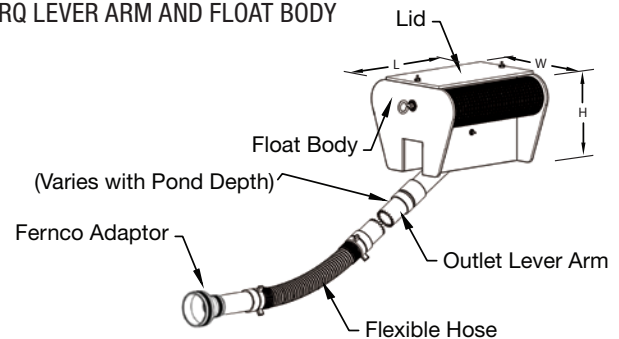
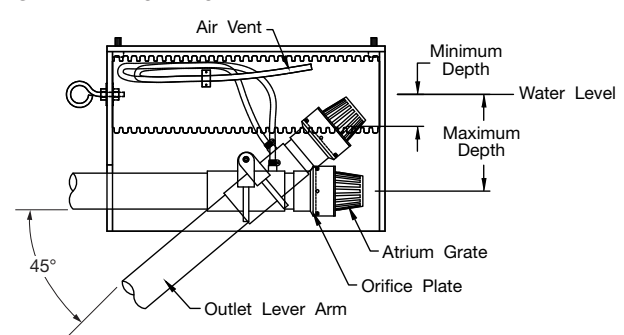


Figure 2

INSIDE THE FLOAT BODY



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RQ Installation

The overall goal of the RQ Pond Outlet design is to minimize the volume of sediment flowing from the pond and also to control, or actually to manage, the quantity of water being discharged, so that the peak flows occur when they are the least detrimental to downstream waterways. In order to achieve these goals, the RQ Outlet must be installed as designed. A few considerations are important to remember during the design and construction phases.

The outlet arm is designed to be essentially level when the pond is empty. When the pond is full, the arm should be inclined at a 45° angle. This design rule applies to all design depths. The difference will be made up in the variable length of the PVC pipe connecting the float body with the bottom part of the discharge pipe. This 45° variance will ensure

that the maximum discharge (when the pond is almost empty) is double the minimum discharge (when the pond is full). The section of pipe between the pre-assembled PVC union and the flexible hose assembly will vary with the maximum depth of the pond.

The below chart provides rough guidelines for determining the length of this length of PVC pipe.

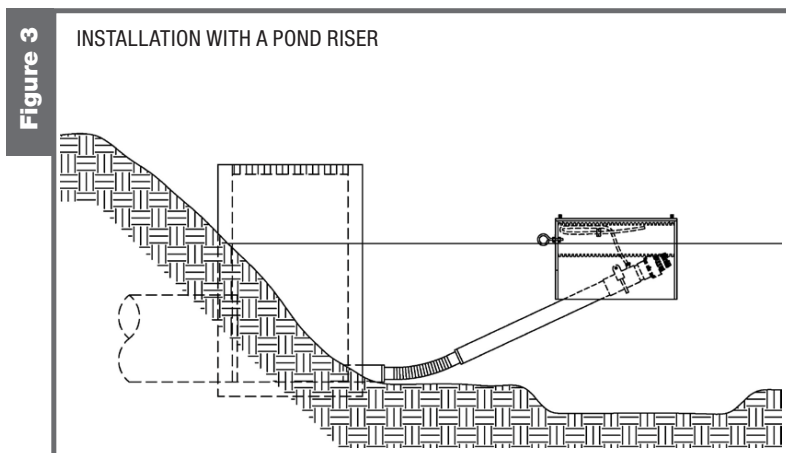
Of course, the deeper the pond, the larger the RQ Outlet will generally be, so there will not be very many ponds that will be 20' deep and sized to have a 1.5" outlet. If multiple lengths of pipe are necessary to achieve the variable pipe length requirement, the joints should be solvent glued.

Maximum Pond Depth (ft.)								
RQ Size	6	8	10	12	14	16	18	20
1.5"	6.5	9.3	12.1	15.0	17.8	20.6	23.5	26.3
2"	6.2	9.1	11.9	14.7	17.5	20.4	23.2	26.0
2.5"	6.0	8.8	11.6	14.5	17.3	20.1	23.0	25.8
3"	5.5	8.3	11.1	14.0	16.8	19.6	22.5	25.3
4"	5.0	7.8	10.6	13.5	16.3	19.1	22.0	24.8
5"	4.2	7.1	9.9	12.7	15.5	18.4	21.2	24.0
6"	3.5	6.3	9.1	12.0	14.8	17.6	20.5	23.3
8"	3.3	6.1	8.9	11.8	14.6	17.4	20.3	23.1

2 Float Body Depression

When the pond is empty and the RQ Outlet lever arm is level, the orifice is still contained within the float body shell, protecting it from debris. Because the lever arm is positioned above the bottom of the body, a depression must be created in the bottom of the pond to accommodate the float body. This allows the float body to settle into and still maintain a level float arm to the outlet pipe. When the pond is almost completely drained, there will still be a few inches of water in the depression, which will infiltrate into the soil, normally within a few hours.

Do NOT overdig the float body depression. The outlet lever arm pipe could be damaged if it is required to support the full weight of the float body. Over time, the float body depression will need to be dug out to the proper depth. This is preferable to over-digging the depression and possibly breaking the outlet lever arm.



The RQ can be installed with a pond riser as show above, or it can be attached directly to a straight pipe running through the pond berm.

RQ Size	Float Body Depression Depth
1.5"	2.5"
2"	2.5"
2.5"	2.5"
3"	2.5"
4"	2.5"
5"	2.3"
6"	2.5"
8"	2.9"

3 Supporting the RQ Laterally

The float body will be subjected to wind, which will push the RQ laterally. The connection to the outlet at the bottom of the lever arm could be compromised if the float body is allowed to be pushed too far out of position. Unless the RQ

can be held in position by some other means, piles which can be made from rebar, should be driven into the bottom of the pond on both sides of the RQ lever arm to keep it in the correct position over the depression.

4 Cutting the Orifice Plate

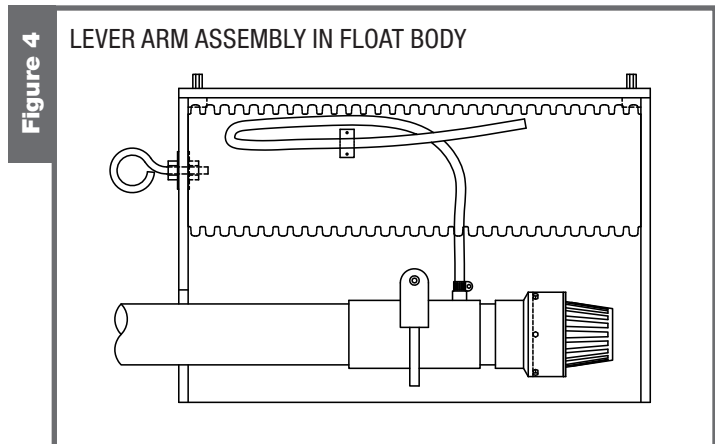
The RQ sizing design aid (available on the Lane Enterprises website) calculates both the size of the RQ Outlet and also the size of the orifice, which is to be drilled into the ¼” thick HDPE orifice plate.

Three blank orifice plates are supplied with each RQ Pond Outlet so that they can be reused on different sites, if necessary. One of the blank plates comes factory installed in the throat of the RQ Lever Arm, just under the Atrium Grate.

To drill the orifice plate to the specified diameter, detach the Atrium Grate and unscrew the screw that holds the orifice plate in place in the throat of the Lever Arm Assembly. Drill the specified hole into the orifice plate using the adjustable plug cutter (included with the RQ Outlet). Then put the orifice plate back into position, and screw it and then put the Atrium Grate back into position. Now the Lever Arm Assembly is ready to be installed into the float body.

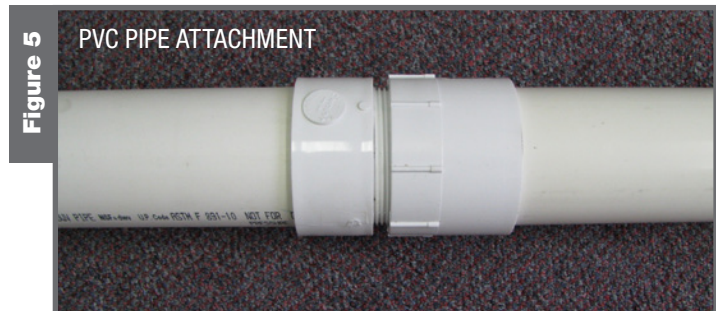
5 Install the Lever Arm Assembly Into the Float Body

Once the orifice plate is reinstalled back into the Lever Arm Assembly, the lever arm can be attached into the float body. Make sure that the Lever Arm Assembly hangs under the stainless steel bolt, not on top of the bolt. Glue the top and mid sections of the Lever Arm Assembly into place, so that the two PVC couplings hold the arm firmly in place within the polyethylene yoke.



6 Attach the Lever Arm Assembly to the PVC Pipe

Next, screw the PVC male adapter into the female adapter, which is now attached to the float body. Then glue the long (variable length) of PVC into the male adapter.

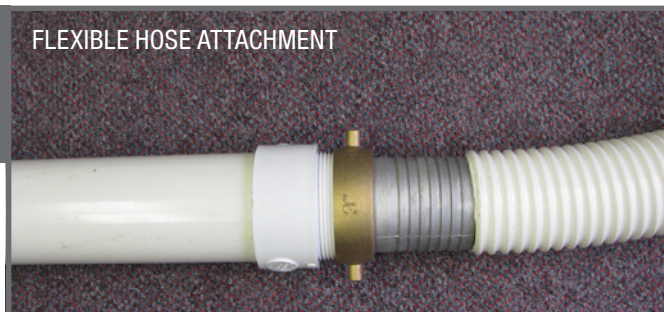


7 Attach the Flexible Hose to the Lever Arm Assembly

Connect the other end of the flexible hose to the swivel female fitting, and tighten with the supplied hose clamps. Then glue the PVC male adapter to the short section of PVC pipe, which will run to the outlet adapter.

Figure 6

FLEXIBLE HOSE ATTACHMENT



Next, attach the supplied Fernco adapter to the PVC pipe, which runs back to the float body. Slip the Fernco adapter over the smoothwall outlet pipe, and tighten the hose clamps.

Figure 7

FERNCO ADAPTER



The above procedure is for connecting to a 6" smoothwall outlet pipe and all of the parts, except for the variable length PVC, are supplied with the RQ Outlet. Other types of pipe and diameters other than 6" can be attached to the RQ, but will require adaptation in the field.

RQ Maintenance

The RQ Pond Outlet is designed to help capture sediment in ponds while the sitework is being done. However, many of these construction-related ponds become permanent. While sedimentation may become less of an issue as the site becomes seeded and paved, quantity discharge related issues can become more of a factor as the site surfaces become generally less permeable due to the installation of pavements and other hard surfaces. Because of the “Reverse Q” nature of the RQ Outlet hydrograph, there are significant benefits to leaving the RQ in place in the finished pond. It can reduce the peak flows and also delay them until later in the drawdown cycle. When left in place, the RQ will continue to provide storm water quantity control long after sedimentation has ceased to be the major concern.

There are two maintenance related concern associated with the RQ Pond Outlet.

Sedimentation

Like all storm water BMPs that are designed to capture pollutants, inspection and maintenance are required to make sure that the RQ is working properly. The RQ Pond Outlet is designed to allow for maximum settling of sediment, and therefore, will result in sediment building up on the bottom of the pond. As mentioned earlier, it is important that the float body depression NOT be overdug in an effort to allow for

future sediment buildup. It is better that the float body settle a few inches higher after a period of time than have the lever arm outlet damaged by being forced to support the weight of the float body. After the RQ has been in place for a year, it should be inspected while resting in the empty pond. Check the outlet pipe to make sure that it is still level. Dig out the depression if necessary.

Clogging

Hundreds of thousands, if not millions, of gallons of storm water will flow through the RQ orifice during the first year of operation. The orifice is always within the solid part of the float body so it is very well protected from floating debris. In addition, the removable lid protects the orifice from being clogged by floating leaves and twigs. None of this, though, means that there is 100% certainty that the orifice will remain debris free.

To inspect the RQ Outlet, remove the lid and turn the float body on its side. Turn the float body so that the screw holding the Atrium Grate can be removed and the grate detached. The orifice can be visually inspected and, if necessary, removed and cleaned. A plumber’s snake can be used to pull debris out of the line. The Fernco adapter can also be detached from the outlet pipe or the stub in the pond riser and then reattached once the line has been cleaned.

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