Chapter 11
ISCO Aquatic Life Passage

ISCO A.L.P (Aquatic Life Passage)

Snap-Tite® now offers an interior open profiled HDPE pipe up to 120" in diameter designed to enhance aquatic life passage. ISCO A.L.P.'s internal structure is comparable to that of CMP, but manufactured with a more durable, corrosion-resistant, and abrasion-resistant material. Fish and other aquatic organisms can now migrate more easily through their physical environment but with a pipe constructed of HDPE, offering a much longer service life. The interior profiles act as "roughness elements" that decrease the flow velocity and allow for some silt and stream bed material to collect inside.

ISCO ALP was originally envisioned as a "fish-friendly" solution to failing culverts that is economically feasible, quickly installed and non-disruptive to the motoring public. Relining these culverts with Snap-Tite products has always been a possible and popular solution. However, ISCO ALP is also an ideal solution for a direct buried culvert for enviormnetally sensitve areas where aquatic life demands can be solved with this inventive product approach.

Additionally, Snap-Tite® can install available baffles in both ALP and smooth wall piping to solve depth and velocity problems within a culvert during flow extremes. In low-flow situations, most baffles act as weirs to create small pools of standing water. As the flow increases, the water rises up over the baffles. The baffles help decrease flow velocity while creating resting areas for fish to use during high velocity water flow occurrences.

Table 11-1
ISCO A.L.P. Size Range

Nominal Internal Pipe Diameter (in.)	Ring Stiffness Classifications RSC**	Approx. Pipe OD (in.)*	Estimated Weight (lbs./ft length)*
24	160-250	29	20
30	160-250	35	25
36	160-250	41	27
42	160-250	47	30
48	160-250	53	40
54	160-250	59	50
60	160-250	66	60
66	160-250	72	75
72	160-250	78	100
78	160-250	84	125
84	160-250	90	150
90	160-250	96	165
96	160-250	102	180
120	160-250	127	250

* Typical values. Actual values may differ. Additional sizes available.

**RSC is determined by soil properties(direct bury), grout properties(relining), depth of cover, and groundwater elevations. Consult your local Snap-tite Representative

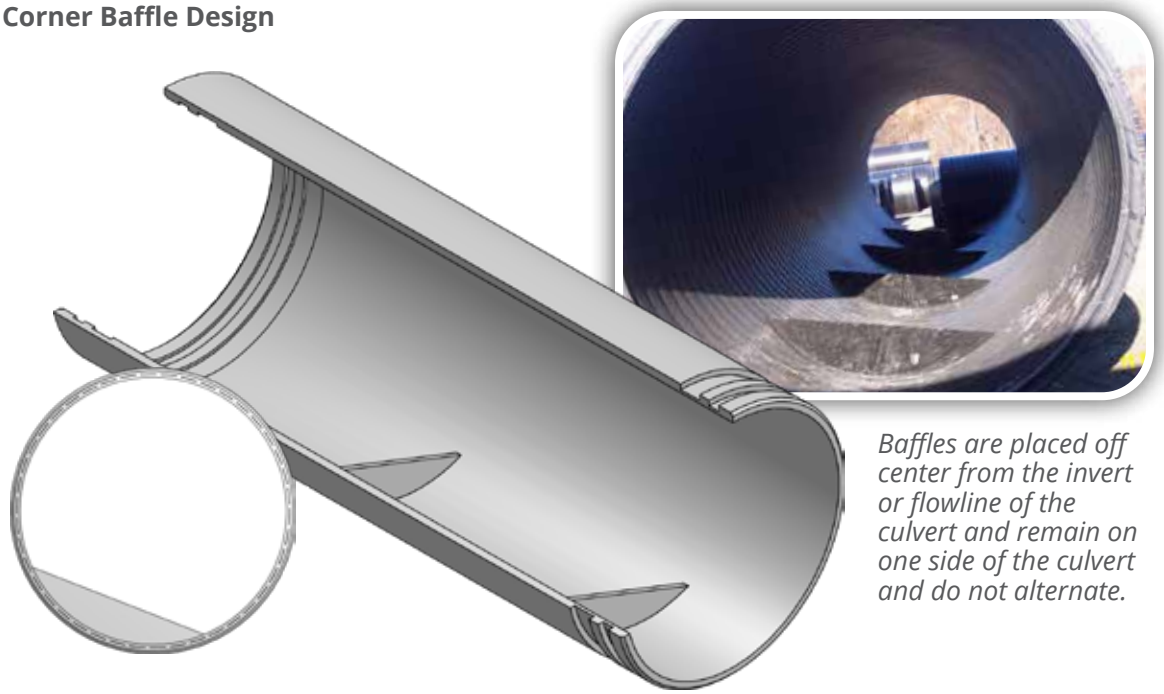
More and more culverts are being accessed as a crossing by fish and other aquatic organisms; however, most culverts are not fully passable. For a fish, on an upstream migration, to successfully negotiate a culvert, it must enter the culvert barrel, traverse the barrel length, exit at the upstream end and proceed to the first resting area. As such, many states are implementing recommendations and guidelines for improving the effectiveness and ecological impact for waterway crossings. Experts tend to agree that the most effective solution for creating unobstructed fish passages is to replace problem culverts with new crossing structures such as bridges or oversized and/or embedded culverts that are able to simulate a natural streambed bottom.

However, many agencies have concluded that due to the number existing culverts and the limited amount of public funds available, it is unlikely and/or impractical that every culvert that impairs fish passage will be removed and replaced with an adequate design. In situations where replacements are not practical or sensible, retrofitting a culvert with baffles may be a reasonable measure to provide some passage improvements. Culvert retrofits are modifications to an existing culvert and/or stream channel in an attempt to reduce barriers and improve fish passage. Baffle retrofits are not considered by many to be long-term solutions, but rather are viewed as a temporary solution until replacement can be logistically and financially viable.

For many years, Snap-Tite® has made its mark as an excellent option for rehabilitating culverts that are failing structurally, where replacement would be costly, untimely, and very disruptive to the surroundings.
Snap-Tite® with factory installed baffles can become a culvert retrofit option that provides the same construction advantages and cost saving benefits, while also providing improvements for aquatic passage.

Most culverts with fish passage problems were designed with a focus on the culvert diameter required to pass a highflow event.

Corner Baffle Design



Baffles are placed off center from the invert or flowline of the culvert and remain on one side of the culvert and do not alternate.

As a result they are undersized because they were designed for stream flow only, without regard to velocity impact on fish passage and other aquatic organisms.

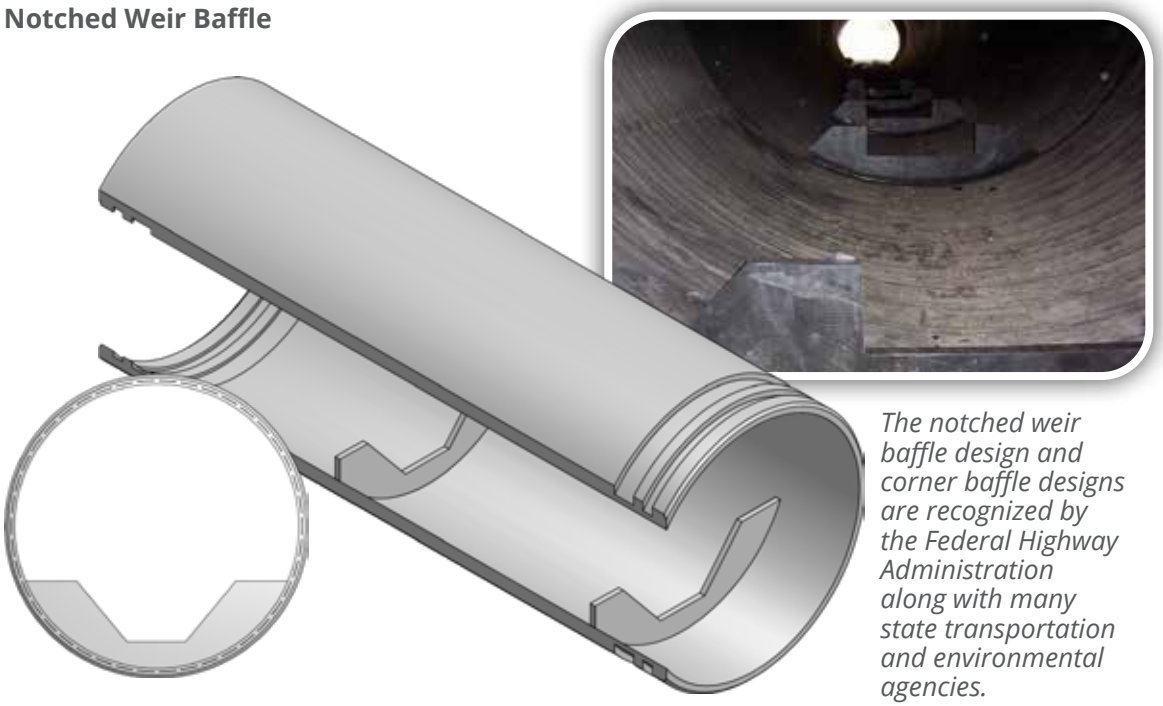
About Baffles

Baffles are used to solve depth and velocity problems within a culvert during flow extremes. In low-flow situations, most baffles act like weirs to create small pools of standing water. As the flow increases, the water rises up on the baffle and the baffles act as roughness elements that decrease the flow velocity, creating resting areas for fish to escape high velocity water streaming through the culvert. Again, it should be noted that baffles are not recommended by leading research organizations for new installations or situations that demand complete replacement of culverts where fish passage is of concern.

When adding baffles to a retrofitted culvert, the culvert now becomes more prone to become blocked or clogged. It is imperative that a regular inspection and maintenance program is developed, otherwise the crossing has exchanged one fish passage problem with another. Inspections and maintenance are typically important during and immediately after high flow events, especially as fish migration occurs in these events. Baffles (and culvert retrofits) are considered part of the hydraulic design option for design methods used in fish passage analysis. Baffles are typically recommended for culverts with a maximum slope of 2.5%-3.5%. (Corner baffles are typically used for slopes less than 2.5% while notched weir baffles are used between 2.5 %and 3.5%.) It is acknowledged that while the goal is to optimize culvert capacity, limit sediment deposition and debris accumulation, limit maximum velocity and maximum turbulence; each criterion will have to be balanced against each of the others for a compromise in the overall design. Culvert retrofits are not expected to be able to satisfy all the requirements of the hydraulic design option. The retrofit design should also be analyzed in conjunction with inlet and outlet control features such as tailwater control measures. The design engineer should consider and evaluate these conditions when specifiying the baffle criterium to Snap-Tite® for fabrication.

The California Department of Transportation (Caltrans) has a published guide, "Fish Passage for Road Crossings", that offers detailed insturuction and information. Chapter 7, Culvert Retrofit Design" is useful for relining considerations. Appendix F, Hydraulics of Baffles, provides information regarding analysis and design of baffled culverts, including baffle configuration, height, and spacing.

Notched Weir Baffle



The notched weir baffle design and corner baffle designs are recognized by the Federal Highway Administration along with many state transportation and environmental agencies.

Is Erosion Control a Problem?

Erosion control is a major concern when rehabbing an existing culvert. Snap-Tite® is your no-dig solution to lining failing culverts, and your answer to erosion control challenges. Not only does Snap-Tite® rehab the culvert, it provides erosion control for the areas surrounding the culvert and maintains a constant elevation, thus making it easier for fish to enter the culvert. Snap-Tite® pipe is made from HDPE pipe, which can be made to fit all of your culvert needs.

Pools adjcent to culvert can play important design elements in ISCO A.L.P.

Ponding effect created by baffle/weir design during low-flow.