

SIMPLE SOLUTIONS FOR GOOD FISH PASSAGE

Maintaining natural stream flows in instream structures

Fish passage guidelines look complex but this P&F Global white paper outlines the simple concepts you need to follow to design instream structures that comply with regulations.

To design an instream structure that complies with regulatory requirements for fish passage, the critical advice is to: **keep the stream bed and stream flow as similar to its natural state as possible.**

Instream structures, such as culverts and weirs, can disrupt natural habitats and create barriers to fish passage (movement and migration) if they are not designed and installed correctly. Disrupted natural habitats prevent fish from moving easily through waterways during their lifecycles and are a major contributing factor in the decline of New Zealand's native fish populations - about 70% of native fish species are threatened or at risk.

THE BASICS: CRITICAL CONCEPTS FOR GOOD FISH PASSAGE

Although the full guidelines are extensively detailed at more than 200 pages long, there are some straightforward principles for good fish passage design. The core concept is that **the design of any instream structure should seek to maintain the instream habitat** and allow fish (at every stage of their lifecycle) to safely and efficiently swim upstream and downstream in a waterway.

To allow for good fish passage, the design of any instream structure should aim to:

- maintain the natural gradient - avoiding steep inclines and/or vertical drops
- maintain water velocities - avoiding excessively rapid flows
- maintain water depth - avoiding extreme shallows
- retain the natural stream bed materials, and allow for natural processes such as the movement of sediment and debris.

During the design of an instream structure, you also need to ensure your solution will:

- support multi-directional/complex flows
- provide a range of navigation path options for fish
- provide rest pools/niches at appropriate intervals for the fish species in your stream environment.

The other key design consideration set out in the fish passage guidelines is that your instream structure should be durable and have minimal maintenance requirements.

THE SIMPLEST SOLUTION: A LARGE INSTREAM CULVERT

A large culvert buried to the right depth is still one of the simplest solutions for an instream structure that meets all of the fish passage requirements outlined in this white paper.

Using a large culvert allows you to embed the structure and simulate the stream environment maintaining the channel width, depth and slope of the stream bed. Inside the culvert you should make sure you recreate the natural substrate too, such as pebbles, gravel, silt and plants that are present elsewhere in the stream.

With a large culvert instream structure you are aiming to offer the same water depths, resting areas and basic habitat that is present in the rest of the river or stream to enable fish species to easily pass and complete their lifecycle.

P&F Global's EUROFLO pipes are one option for instream structures: these robust pipes come in a range of sizes up to 2100mm in diameter, and are made from high density polyethelene (or HDPE) making them maintenance and rust free.



Stream simulation culvert design is the best solution for supporting the movements of fish and other aquatic organisms through culverts.

THE BARRIERS: WHAT TO AVOID IN YOUR INSTREAM STRUCTURE

Ready to design your instream structure? Make sure your instream structure does not create any of these common barriers to fish movement and migration:



- 1 High water velocity inside
- 2 Long culvert, increasing gradient towards upstream end
- 3 Perched above stream



- 4 Shallow water
- 5 Vertical drop
- 6 Turbulent water

The New Zealand Fish Passage Guidelines set out best practice approaches and minimum design standards to allow for fish passage. Full guidelines are available on the Department of Conservation website: <https://www.doc.govt.nz/fishpassage>