

DESIGN GUIDELINES APPROVED FOR USE IN DESIGNING WATER CROSSINGS OVER FISH-BEARING WATERS IN WASHINGTON STATE

WSDOT 2010 Hydraulics Manual – Chapter 7 Fish Passage¹

Notes for appropriate use to comply with WAC 220-660-190

February 18, 2016

Chapter 7 of this document contains three pages of text and provides an overview of water crossing designs related to fish passage, as well as the use of water training structures for fish passage. Chapter 7 simply summarizes water crossing structure types, and the three culvert design methods defined by WDFW. Although the document does not contain any specific criteria or design elements that explicitly provide for the movement of fish or the protection of their habitat and is not intended to be used as a standalone fish passage manual, it is consistent with current WDFW fish passage guidance. It cannot be used by itself to design a water crossing (bridge or culvert) in fish-bearing waters of Washington State. The comments below relate to use of applicable sections of this manual and Washington state Hydraulic Code rules for water crossings WAC 220-660-190. WSDOT assumes that the designer will be using WDFW guidelines and methods. The use of WDFW's methods is not required and these notes are part of an extensive list of alternative ways to design a crossing that, when followed correctly, can result in an acceptable structure.

Chapter 7, Fish Passage

7-1 Introduction

The introduction indicates that the purpose of this chapter is to summarize the WDFW design approaches, note the type of structures recommended, and reference grade control. There is a reference and web link to WDFW guideline: Design of Road Culverts for Fish Passage, 2003. Although most of the information in the 2003 document is still applicable, WDFW published the Water Crossing Design Guidelines as a replacement document in 2013.

¹ WSDOT (2010). **Hydraulics Manual**, version M 23-03.03. Washington Dept. of Transportation, 378 p. (Chapter 7 Fish Passage)

7-2 Designing for Fish Passage

Section 7-2 Designing for Fish Passage goes on to say that the basic concept used to ensure continued fish passage is to design the stream crossing to match the natural river or creek channel as much as practical, which is consistent with WDFW guidance for bridges, no-slope and stream simulation culverts. To be specific, WAC 220-660-190(2)a says that,

All water crossings must retain up-stream and downstream connection in order to maintain expected channel processes. These processes include the movement and distribution of wood and sediment and shifting channel patterns. Water crossings that are too small in relation to the stream can block or alter these processes, although some encroachment of the flood plain and channel migration zone will be approved when it can be shown that such encroachment has minimal impacts to fish life and habitat that supports fish life.

Water crossings designs that create measurable impacts to habitat will have to mitigate.

7-2.2 Types of Structures

This section describes three basic types of stream crossing structures for fish passage:

1. Bridges – Structures that have piers or abutments supporting some type of girder system. Bridges do not have a significant impact on fish migration and are the preferred method of spanning a body of water. HQ Hydraulics is responsible for all water elements concerning bridge design.
2. Open Bottom Culverts – Metal and concrete arches or three-sided concrete frame structures that have no floor and are supported by footings.
3. Full Culverts – Metal, concrete, and plastic round, pipe arch, elliptical, and box-shaped culverts that are completely enclosed self-supporting structures.

7-2.3 Culvert Design Approach

3. The Hydraulic Design Option: WSDOT neglects to say that this option can have significant impacts to channel processes and may block the passage of weak-swimming or non-jumping fish. Measurable impacts will have to be mitigated. Hydraulic culverts also require regular inspection for their life span and maintenance when they are found to be out of compliance with criteria. Hydraulic culverts are permitted under WAC 220-660-200.

7-2.4 River Training Devices

This concept has very limited application and is probably best left to the skilled designers of hydroelectric facilities, trap and haul weirs, or other major river engineering projects that can be hazardous to fish. Fish are well adapted to migrate in natural river channels and do not need any help. It is not likely that a bank protection project would be permitted as an aid to fish migration.