

**APPENDIX 7A**

**RECOMMENDED DESIGN CRITERIA FOR  
DOWNSTREAM AND UPSTREAM FISH PASSAGE**



Table 7A-1. Recommended design criteria and guidelines for downstream fish passage.

Parameter	NMFS <sup>1</sup> and ODFW <sup>2</sup> Fry Criteria
Maximum approach velocity (fps)	0.40
Minimum sweeping velocity (fps)	> than approach velocity
Minimum screen area (ft <sup>2</sup> )	1.0
Minimum open area	27%
Maximum screen opening (in)	
Perforated plate (in)	3/32
Mesh/woven wire screen, in long direction (in)	3/32
Profile bar screen (in)	.0689

<sup>1</sup> NMFS, 1995.

<sup>2</sup> ODFW, 2001.

Table 7A-2. Recommended design criteria and guidelines for upstream fish passage.

Parameter	Criteria (* = Expected Condition)		Reference
<b>Flow Criteria</b>			
High flow design discharge	10% exceedence flow for months of adult migration		ODFW, 1999
Low flow design discharge	95% exceedence flow for months of adult migration		ODFW, 1999
<b>Design Criteria and Guidelines</b>			
Culverts (some criteria may also apply to fishways in general)			
Minimum water depth (ft)			ODFW, 1999
Adult steelhead and Chinook salmon	1.00		
Other salmon, sea-run cutthroat trout and other trout > 20inches in length	0.83		
Trout under 20 inches, kokanee and migrating juvenile salmon and steelhead	0.66*		
Maximum vertical jump (ft)			ODFW, 1999
Salmon and steelhead adults	1.0		
Trout and kokanee adults and steelhead juveniles	0.5*		
Jump pool min. depth (ft)	1.5 x jump height, 2.0 feet minimum*		ODFW, 1999
Average water velocity at high flow (fps)	Trout > 6 in*	Juv. salmonids	ODFW, 1999
Culverts under 60 ft	4.0	2.0	
Culverts 60 ft to 100 ft	4.0	2.0	
Culverts 100 ft to 200 ft	3.0	strmbd sim.	
Culverts 200 ft to 300 ft	2.0	strmbd sim.	
Culverts over 300 ft	1.0	strmbd sim.	
Fishway Entrances			
Maximum entrance head (ft)	1.2 to 1.5		Bates, 1993
Transportation channel velocity (fps)	1.0 to 4.0		
Pool and Weir Fishways			
Min. pool volume, based on energy dissipation criteria 4 fps/ft <sup>3</sup> of volume	V (cf) = 1 6x Q (cfs) x h (ft)		
Density of fish in pool (ft <sup>3</sup> per lb fish)	0.4		
Minimum orifice size	15 inches wide x 18 inches high		

\* = Expected condition.