

WAC 220-660-200 Fish passage improvement structures. The provisions in this section apply to fish ladders, weirs constructed for fish passage management, roughened channels, trap-and-haul operations, and hydraulic design culvert retrofits.

(1) **Description:** Fish passage improvement structures facilitate the passage of fish through or around a barrier. They restore upstream and downstream fish access to habitats that have become isolated by human activities such as placing culverts, dams, and other artificial obstructions.

(2) **Fish life concerns:** Barriers can block fish from using upstream spawning and rearing habitat. The main goal is to remove fish passage barriers and ensure unimpeded passage of fish at all life stages, as well as to maintain natural channel processes and function. However, when it is not feasible to remove a barrier, a fish passage improvement structure may be an alternative mitigation measure. The department does not generally recommend using fish passage improvement structures because they can be partial barriers to fish passage and generally require maintenance. Fish passage improvement structures that mainly pass one species or class of fish may unintentionally limit the passage of other species.

(3) **Fish passage improvement structure design:**

(a) Fish passage improvement structures should not be used to bypass permanent natural barriers except in limited situations where they are needed to restore native fish species.

(b) A person must provide site and biological information relevant to the specific project, such as information on species present, hydrology and topography, and existing adjacent structures.

(c) The department may require compensatory mitigation if a fish passage structure cannot pass all fish species present at all mobile life stages.

(d) The design must consider site-specific conditions that could affect the function of the fish passage improvement structure. These include meander migration or vertical change in stream bed elevation, debris and bedload movement, tampering, vandalism, and poaching.

(e) The fish passage structure design must withstand the maximum expected flow.

(f) The fish passage structure must not result in significant migratory delays as determined by the department or mortality to fish life due to disorientation, distraction, predation, stress, or injury.

(g) The fish passage structure must accommodate expected run sizes to prevent crowding and significant delay of fish migration as determined by the department.

(h) The department will determine the inspection interval depending on the type of fish passage improvement structure and watershed conditions.

(i) The department may require the installation of a temporary fish passage structure to provide passage through temporary obstructions. The department may not require a fish passage structure if a barrier exists for such short duration that the department determines that no lasting impacts to fish life will occur.

(4) **Temporary fish passage improvement structures design:**

(a) A person must maintain a fish passage structure in an effective condition. If the structure starts to hinder fish passage, the person must obtain an HPA and promptly repair the problem.

(b) The department may approve the installation of temporary fish passage improvement structures when permanent structures are damaged or are under construction, to conduct maintenance or repair, for en-

hancement projects, or for seasonal water diversion structures such as irrigation diversion dams.

(c) Temporary fish passage improvement structures must remain operational for the duration of the temporary obstruction and must be maintained and adjusted as needed to provide efficient passage of fish life.

(5) **Fish ladder design:**

(a) The department may authorize a fish ladder if:

(i) The fish ladder will enable fish passage at an existing barrier, but only until the existing barrier structure is replaced; or

(ii) The department determines that constructing a bridge, culvert, or roughened channel is not feasible due to the nature of the obstruction such as a flow control structure or the slope of the stream.

(b) The fish ladder design must be appropriate for the slope of the channel, water surface elevations, species present, flow regime, and conditions of the channel.

(c) The fish ladder must be designed to prevent fish from leaping out of the structure.

(d) The fish ladder pool volume must provide the hydraulic and fish capacity needed to pass all adult and juvenile fish.

(e) The fish ladder entrance (downstream end):

(i) Must provide enough streaming flow attraction during high and low flows, without excessive velocity or turbulence, to ensure fish can locate and enter the fish ladder without significant delay;

(ii) Must minimize distractions that lure fish away from the entrance to prevent fish from becoming trapped, injured, or stranded;

(iii) Must be large enough to accommodate all expected debris and ice without damage or loss of passage efficiency;

(iv) Must provide a stable flow pattern and uniform velocity at the entrance pools and transition channels to allow fish to pass through the structure unimpeded;

(v) Must provide multiple entrances to the fish ladder if a single entrance cannot attract and provide passage to all adult and juvenile fish. If the work area has multiple zones where fish accumulate, each zone must have at least one entrance; and

(vi) May be required to have artificial light to optimize fish passage.

(f) Fish ladder auxiliary water supply system (AWS):

(i) To ensure fish are attracted to the fish ladder, an AWS may be required that supplies supplementary water.

(ii) An AWS must have a diffuser design that discourages attraction of fish life to it and protects fish from injury.

(iii) An AWS must minimize the size of spaces between the diffuser to exclude and prevent injury to the smallest fish present.

(iv) An AWS must not use an auxiliary water supply from external sources that could confuse the homing instinct of fish.

(g) To prevent harm to fish life, the department may require screening of the AWS.

(h) The department may require a trash rack at the AWS intake.

(i) Fish ladder exits must:

(i) Have a water depth that is similar to the depth inside the fish ladder;

(ii) Be located to ensure fish can safely exit the structure without susceptibility to predators, without becoming disoriented, and with the ability to continue their upstream migration; and

(iii) Be designed to protect the exit from damage by debris.

(6) **Fish ladder construction:** To reduce potential contact injuries, all edges and surfaces exposed to fish must be ground smooth to the touch, with all edges aligning in a single smooth plane.

(7) **Fish ladder operation and maintenance:**

(a) If target fish species are present and actively migrating, fish ladders with AWS must have enough water available at all stream flows to pass fish safely and efficiently through the fish ladder or the main channel without the need of a fish ladder.

(b) A person must inspect the fish ladder for proper function at a frequency determined by the department. Place wood and sediment retrieved during inspection and maintenance downstream of the fish ladder.

(c) A person operating or maintaining the fish ladder must be able to identify maintenance issues with the fish ladder and take corrective actions or notify the department if maintenance issues arise.

(d) The department may require shutdown of the fish ladder during high flows if the flow exceeds the fish passage design flow. However, a fish ladder must not be inoperable due to high flows for longer than seven days during the migration period for the target fish species. This provision applies to locations where the shutdown will not cause flooding or damage to structures, other structures of value or property.

(8) **Fish passage weir design:**

(a) Design the weir to control the water surface elevation at the weir to provide fish passage over or through an obstruction.

(b) Design the weir to minimize impacts to natural channel geometry.

(c) Design the weir to ensure continued fish passage for all species present at all mobile life stages. The department may approve exceptions when it is implementing a program to restore native fish species or to protect native fish species from the introduction of nonnative fish species, and fish passage blockage is an intended component of the project.

(9) **Roughened channel design:**

(a) The department may authorize a person to construct a roughened channel to facilitate the passage of fish around abrupt hydraulic drops, through culverts, or at diversion sites for water withdrawal.

(b) Roughened channels must be designed by licensed professional engineers, geomorphologists, or other qualified professionals approved by the department.

(c) Where nonleaping fish are present or when other types of fish passage improvement structures would not pass fish well enough as determined by the department, a person may be required to construct a roughened channel to bypass an obstruction.

(d) Roughened channels must create an average cross-section velocity within the limits of fish-passage design criteria and the hydraulic design option.

(e) Roughened channels must minimize impact on the existing fish life and habitat that supports fish life.

(f) The size and gradation of roughened channel bed material must resist erosion at the maximum expected flow and must result in a dense structure that prevents subsurface flow.

(10) **Trap-and-haul operations:**

(a) The department requires an HPA for installing, maintaining, and removing fish traps for trap-and-haul activities.

(b) The fish trap must be designed to withstand the maximum expected flow.

(c) The fish trap must be operated in a manner that prevents crowding and delaying target fish species migration as determined by the department.

(11) Hydraulic design culvert fish passage design:

(a) The department may authorize an existing hydraulic design culvert to remain in place until the end of its design life or until another more appropriate culvert design can be constructed. However, a hydraulic design culvert cannot remain in place to the end of its design life if it does not provide for passage of fish.

(b) Before obtaining a permit to retrofit a culvert or construct a fish passage improvement structure using the hydraulic design method, a person must submit appropriate hydrology data and hydraulic design documentation prepared by a licensed professional engineer that demonstrates compliance with this section.

(c) The hydraulic design fish passage structure must include consideration of flood capacity for current conditions and future changes likely to occur within the stream channel, and debris and bedload passage.

(d) Plans submitted to the department to retrofit a culvert or to construct a fish passage improvement structure using the hydraulic design method must comply with the following:

(i) Minimum water depth at any location within a hydraulic design passage structure without a natural bed must be at least eight-tenths of a foot. The minimum depth of flow in the passage structure is determined by:

(A) The low flow design, which is the two-year seven-day low flow discharge for the subject basin; or

(B) When flow information for the site is unavailable, the department may authorize the use of calibrated flows from a comparable gauged site or the depth of the culvert when no water is flowing.

(ii) Maximum water velocity may not exceed the values in Table 1 at any point within a culvert. Measure maximum water velocity at the high fish passage design flow.

Table 2

Maximum Velocity Design Criteria for Hydraulic Design Culvert Installation

| Culvert Length | Maximum Velocity |
|-----------------------|-------------------------|
| 10 - 100 ft. | 4.0 feet per second |
| 100 - 200 ft. | 3.0 feet per second |
| > 200 ft. | 2.0 feet per second |

(e) The hydraulic drop within the culvert or at the culvert inlet or outlet may not exceed one-half foot. When a drop has a submerged jet (the lowest part is below the downstream water surface) or is part of a natural or roughened channel design, the department may approve an exception to this drop limit.

(f) Water turbulence within the culvert must not be a barrier to passage of target fish species.

(g) The department may modify or approve design flow criteria for specific proposals as needed to address unusual fish passage requirements.

[Statutory Authority: RCW 77.04.012, 77.04.020, and 77.12.047. WSR 15-02-029 (Order 14-353), § 220-660-200, filed 12/30/14, effective 7/1/15.]