



National Marine Fisheries Service
Southwest Region

JUVENILE FISH SCREEN CRITERIA
FOR PUMP INTAKES

Developed by
National Marine Fisheries Service
Environmental & Technical Services Division
Portland, Oregon
May 9, 1996

ADDENDUM
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The following criteria serve as an addendum to current National Marine Fisheries Service gravity intake juvenile fish screen criteria. These criteria apply to new pump intake screens and existing inadequate pump intake screens, as determined by fisheries agencies with project jurisdiction.

Definitions used in pump intake screen criteria

Pump intake screens are defined as screening devices attached directly to a pressurized diversion intake pipe.

Effective screen area is calculated by subtracting screen area occluded by structural members from the total screen area.

Screen mesh opening is the narrowest opening in screen mesh.

Approach velocity is the calculated velocity component perpendicular to the screen face.

Sweeping velocity is the flow velocity component parallel to the screen face with the pump turned off.

Active pump intake screens are equipped with a cleaning system with proven cleaning capability, and are cleaned as frequently as necessary to keep the screens clean.

Passive pump intake screens have no cleaning system and should only be used when the debris load is expected to be low, and

- 1) if a small screen (less than 1 CFS pump) is over-sized to eliminate debris impingement, and
- 2) where sufficient sweeping velocity exists to eliminate debris build-up on the screen surface, and
- 3) if the maximum diverted flow is less than .01% of the total minimum streamflow, or
- 4) the intake is deep in a reservoir, away from the shoreline.

Pump Intake Screen Flow Criteria

The **minimum effective screen area** in square feet for an **active** pump intake screen is calculated by dividing the maximum flow rate in cubic feet per second (CFS) by an approach velocity of **0.4 feet per second (FPS)**. The **minimum effective screen area** in square feet for a **passive** pump intake screen is calculated by dividing the maximum flow rate in CFS by an approach velocity of **0.2 FPS**. Certain site conditions may allow for a waiver of the 0.2 FPS approach velocity criteria and allow a passive screen to be installed using 0.4 FPS as design criteria. These cases will be considered on a site-by-site basis by the fisheries agencies.

If fry-sized salmonids (i.e. less than 60 millimeter fork length) are not ever present at the site and larger juvenile salmonids are present (as determined by agency biologists), approach velocity shall not exceed 0.8 FPS for active pump intake screens, or 0.4 FPS for passive pump intake screens. The allowable flow should be distributed to achieve uniform approach velocity (plus or minus 10%) over the entire screen area. Additional screen area or flow baffling may be required to account for designs with non-uniform approach velocity.

Pump Intake Screen Mesh Material

Screen mesh openings shall not exceed **3/32 inch** (2.38 mm) for woven wire or perforated plate screens, or 0.0689 inch (**1.75 mm**) for profile wire screens, with a minimum **27% open area**. If fry-sized salmonids are never present at the site (by determination of agency biologists) screen mesh openings shall not exceed **1/4 inch** (6.35 mm) for woven wire, perforated plate screens, or profile wire screens, with a minimum of **40% open area**.

Screen mesh material and support structure shall work in tandem to be sufficiently durable to withstand the rigors of the installation site. No gaps greater than 3/32 inch shall exist in any type screen mesh or at points of mesh attachment. Special mesh materials that inhibit aquatic growth may be required at some sites.

Pump Intake Screen Location

When possible, pump intake screens shall be placed in locations with **sufficient sweeping velocity** to sweep away debris removed from the screen face. Pump intake screens **shall be submerged** to a depth of at least one screen radius below the minimum water surface, with a minimum of one screen radius clearance between screen surfaces and adjacent natural or constructed features. A **clear escape route** should exist for fish that approach the intake volitionally or otherwise. For example, if a pump intake is located off of the river (such as in an intake lagoon), a conventional open channel screen should be considered, placed in the channel or at the edge of the river. Intakes in reservoirs should be as deep as practical, to reduce the numbers of juvenile salmonids that approach the intake. Adverse alterations to riverine habitat shall be minimized.

Pump Intake Screen Protection

Pump intake screens **shall be protected** from heavy debris, icing and other conditions that may compromise screen integrity. Protection can be provided by using log booms, trash racks or mechanisms for removing the intake from the river during adverse conditions. An **inspection and maintenance plan** for the pump intake screen is required, to ensure that the screen is operating as designed per these criteria.