

Abstraction intake design checklist

Mitigation requirement	Requirement detail	Has this been provided? (Y/N/explanation if not)
Hands-off flow and variability	<p>The design must indicate how the required hands off flow, including any seasonal variation, will be provided.</p> <p>The design must indicate how the required Q80 at Q30 upstream flows will be provided.</p>	
Height of impoundment	<p>The design must indicate clearly the height of the impoundment, from the toe of the downstream edge to the crest.</p> <p>The design must indicate how the impounding structure will connect to the existing banks.</p>	
Protection of downstream fish passage (if downstream passage is likely – see note 2)	<p>Screen type</p> <p>A Coanda is required, except where it is agreed that upstream fish densities are very low, or where a Coanda would be too large a structure to be feasible.</p> <p>If a side intake is proposed, the approach velocities should be stated. These must not exceed 0.3m/second.</p> <p>Screen spacing</p> <p>These must not be greater than 10mm.</p> <p>Lip below screen</p> <p>This should be chamfered and should not protrude too far. The design should avoid creating a ledge where fish may become stranded'.</p>	
Plunge pool details	<p>Depth (see diagram 3)</p> <p>The plunge pool depth must be at least 1/3 the vertical height fish can drop from, or 1m, whichever is smaller.</p> <p>Length</p> <p>The plunge pool length must be sufficient to capture all water spilling over the weir. This must not overshoot the plunge pool.</p> <p>Width (see diagram 1)</p> <p>The plunge pool must cover the full width of the structure.</p> <p>Exit notch (see diagram 1)</p> <p>This must be suitably sized for fish - a minimum of 150mm wide, maintaining at least 100mm depth of water.</p> <p>Drop from plunge pool to river bed (see diagram 3)</p> <p>There should not be a large drop unless there is sufficient water depth in the river below - if $\geq 0.5\text{m}$ drop the depth of water d/s must be 1/3 of the drop height.</p> <p>There must be a defined, sealed channel below the intake/plunge pool (not created from rip-rap or similar).</p>	

<p>Protection of upstream passage of fish</p>	<p>Fish Pass</p> <p>A fish pass must be included, if specified in the CAR licence. The design of a any fish pass should be based on Environment Agency manual www.gov.uk/government/uploads/system/uploads/attachment_data/file/298053/geho0910btbp-e-e.pdf</p>	
<p>Tailrace design</p> <p>These requirements must be met if migratory fish and/or spawning habitat is present upstream of the tailrace.</p>	<p>Design</p> <p>The design must indicate clearly the outfall type and position e.g. whether it is set back from the river, raised, or submerged.</p> <p>The design must also show the river levels, to indicate whether the outfall is accessible. The levels shown should be related to the specific river flow.</p>	
	<p>Screening</p> <p>The drawing must show that the outfall has been designed with bar spacing no greater than 20mm, unless adult fish are absent.</p> <p>The screen should be situated next to the river. If a stilling pool is used the screen must prevent adult fish entering the outfall.</p>	
	<p>Velocity</p> <p>The outflow velocity must not be attractive to fish, and ideally <0.5m/s.</p> <p>The tailrace must be designed with measures in place to dissipate the energy of the discharge.</p> <p>The predicted velocity must be detailed in the submitted design drawings.</p>	
	<p>Position</p> <p>The outfall must be angled downstream, so as to protect banking and avoid competing flows that could distract migrating fish.</p> <p>The outfall must be positioned on a stable section of the water environment, so as to reduce the potential for scouring and sedimentation.</p>	

Name:

Date:

Signature:

The following diagrams show specific sections of an idealised impounding works intake.

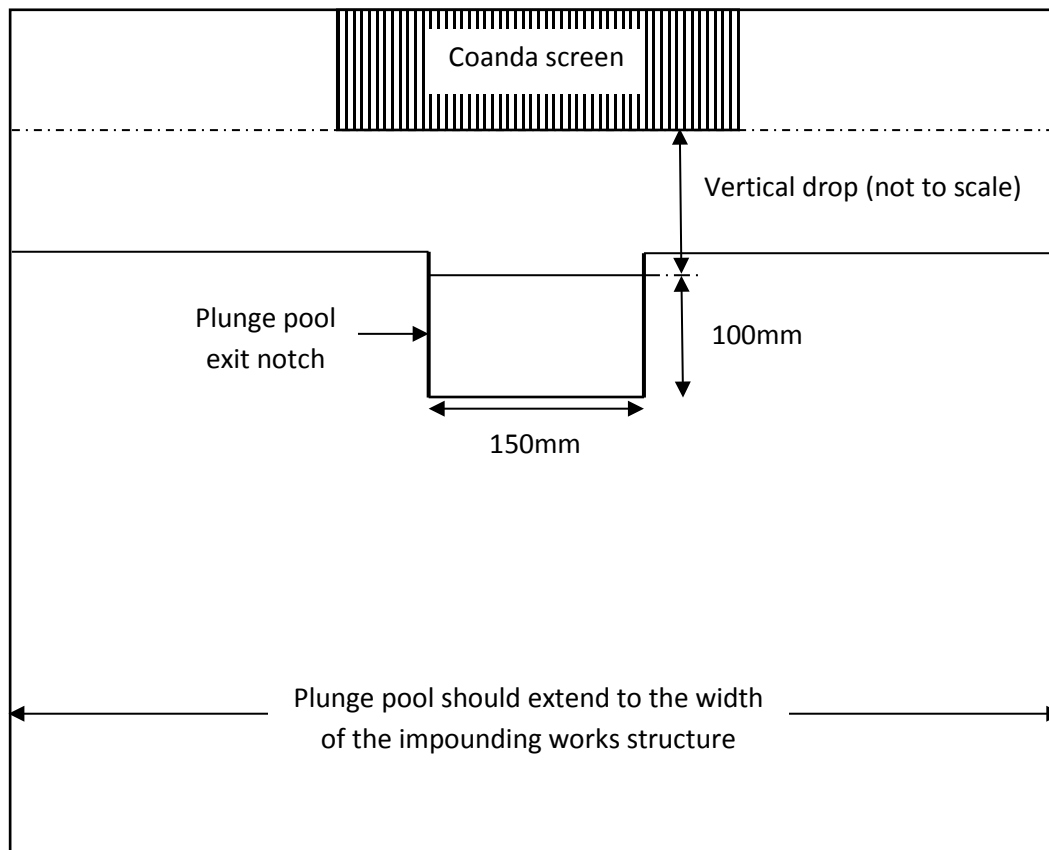


Diagram 1: Minimum required dimensions of plunge pool exit notch. (Looking upstream towards intake weir).

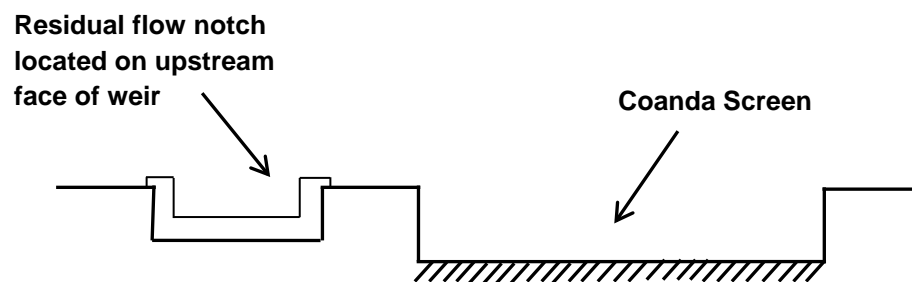


Diagram 2: Schematic example of a wide shallow thin plate notch for delivering residual flows and its position relative to the intake weir (looking upstream towards intake weir). The HoF would be delivered through the intake weir, as in Diagram 4.

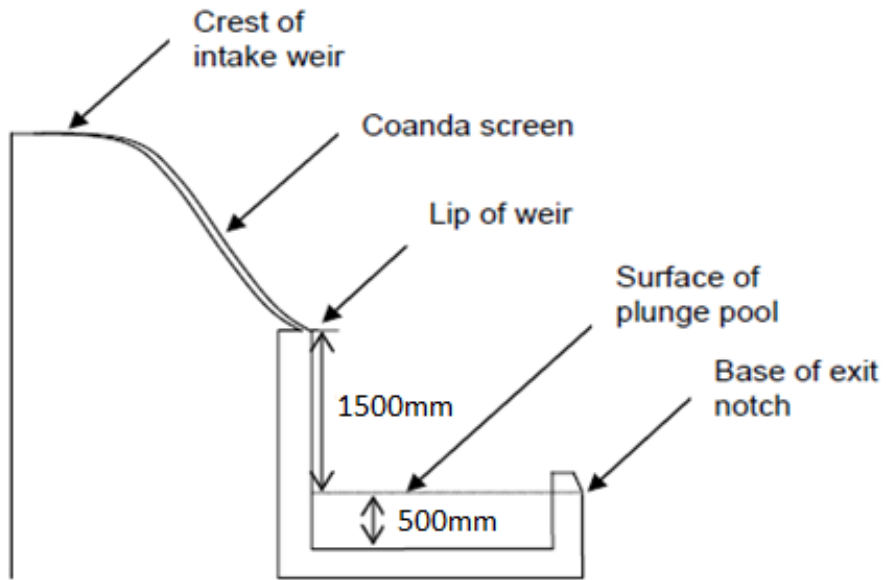


Diagram 3: Cross-section of a coanda intake weir, showing plunge pool depth where the vertical drop is 1500mm

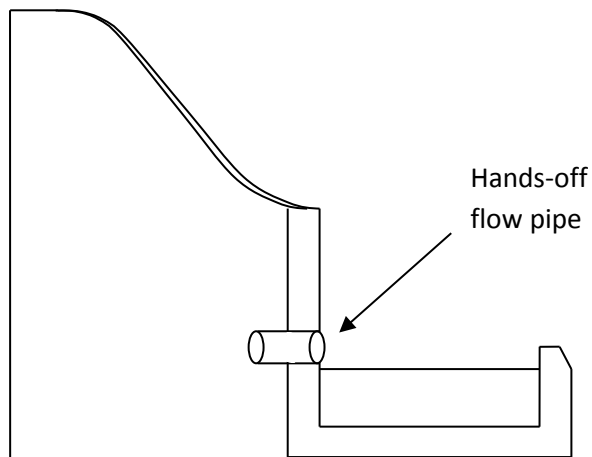


Diagram 4: Cross-section of a coanda intake weir, showing position of hands-off flow pipe through the weir, from the intake chamber to the plunge pool.



Photograph 1: Example intake and mitigation structure, showing the release of compensation flows via a pipe with orifice plate straight from the intake chamber.

Notes

1) Drawings should be shown with reference to the specific site, not just showing a stand-alone design of the structure i.e. they should show how structures tie into the bankside, the angle to the river at which they lie, and how river levels (at low and high flows) relate to the structures. This is key to determining how well potential impacts would be mitigated.

2) Downstream passage is likely if suitable upstream habitat for fish exists. This may be supported by fish survey results, and has increased significance if:

- Migratory fish (e.g. salmon, sea trout, eel or lamprey) are likely to be present upstream of the intake weir (i.e. barriers downstream are absent and upstream passage is to be provided at the intake); or
- There is a loch upstream of the intake. River systems with lochs on them are often more productive, with a higher likelihood of downstream movement of fish.

Check that a plunge pool details have been provided.

Check that height of impoundment has been provided.

Check that plunge pool exit notch dimensions have been provided. In case of confusion, this is the exit point from the pool to the downstream river. We would typically expect this to be in the region 150mm width x 100mm depth.

Check intake screen dimensions. Coanda screens are our default intake screen so a justification will be required if another screen is chosen.

Check tailrace screen dimensions.

Check that the tailrace screen is sited correctly. It should be designed to ensure that migrating fish are not attracted to the tailrace and are not diverted from upstream migration by the presence of competing tailrace flows. The screen should be sited at the end of the stilling pool next to the river and not at the outfall.