1 INTRODUCTION
Aquashear Coanda intake screens are designed to provide an extremely low maintenance screening solution for water intakes without the need for any moving parts. This self-cleaning ability together with a high abstracted flow capacity is a function of the shape of the screen and the arrangement of the wedge wires that make up the screen material.

The screens are usually installed on the downstream side of a weir. The river water flows over the top of the screen, clean water and fine silt particles (<1mm) pass through the screens, whilst larger silt and debris is excluded and deposited downstream. During times of low river flow the screen capacity may be greater than the available water. Under these conditions debris can build up on the lower parts of the screen. This will be washed off the next time the river flow rises above the screen capacity.

2 SPECIFICATION & CAPACITY
These types of screen are supplied as one-piece fully welded units, with integral endplates to help seal at the sides. All have the following standard characteristics:

- Wedge wire aperture 1.0mm
- One-piece welded construction with integral endplates
- All 304 stainless steel (316 available on request)

The three types refer to three different heights, which equates to the headloss from the weir crest to the foot of the screen (sump control level). The type of screen to be used will depend on how much head and width is available at the intake site, and also on the required flow rate. Dulas can advise on which screens are most suitable for a given site. The basic features are outlined in the following table – for more details see the full specification table at the end of this document.

<table>
<thead>
<tr>
<th>Type of Screen</th>
<th>Headloss (mm)</th>
<th>Rated flow per metre width (l/s)</th>
<th>Width Range (mm)</th>
<th>Flow Range (l/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type B “Full Height”</td>
<td>1270</td>
<td>140</td>
<td>600 - 1200</td>
<td>80 - 160</td>
</tr>
<tr>
<td>Type D “Half Height”</td>
<td>700</td>
<td>70</td>
<td>300 - 1500</td>
<td>20 - 100</td>
</tr>
<tr>
<td>Type E “Quarter Height”</td>
<td>400</td>
<td>35</td>
<td>300 - 1500</td>
<td>10 - 50</td>
</tr>
</tbody>
</table>

If higher flows are required, multiple screen installation should be considered (Types A, AB, C or F). If head loss is very limited then Type F quarter height screens may be the best solution, although the length of weir required could be considerable.

Laboratory and on-site tests have indicated that the screens can have up to 50% higher capacity than the rated value. The rated capacities are guaranteed when first installed, and the extra capacity allows for reduction in performance due to abrasion over time (see below).

2.1 Drawings
Details of the screens and installation requirements are shown on the individual drawings listed at the end of this document. The drawings also give suggestions for concrete arrangements.
2.2 Parts
These screens are supplied as a single fully welded unit, consisting of:
- Curved acceleration plate to provide fast laminar water flow down the face
- Screen material made from wedge wire
- Foot plate with fixing holes
- Integral endplates to help seal to the concrete wing walls

Concrete fixings are not supplied (see below).

2.3 Prefabricated Sumps
At some remote sites prefabricated stainless steel sumps have been used instead of concrete for the smaller screens. These are referred to as Type-S, and the design is site specific. More details are available on request.

3 INTAKE STRUCTURE DESIGN CONSIDERATIONS
Typical installation sections and elevations are shown in the drawings. In addition, the following points should be considered when designing the intake structure. Dulas can advise during the design phase if required.

1. If the site is subject to extreme flood flows with movement of large rocks then installation of the screens out of the main river flow is recommended in order to prevent physical damage. They can be placed in a separate structure behind a wing wall or at the end of a side channel.
2. The sump chamber must be deep/wide enough to take the required flow. The weir walls can be overhung to provide extra width if required.
3. The sump chamber under the screens should ideally be vented to atmosphere to prevent air locks and to allow water to flow freely through the screens.
4. A sluice gate, stoplogs, or similar should be installed in the weir to enable the weir pool to be drained and the screens de-watered for maintenance or inspection.
5. Safe access should be provided to the foot of the screens to allow maintenance (brushing down, or removal/replacement). A 500mm wide concrete ledge set about 500-700mm below the foot of the screens is ideal, but may not be practical. Clip-wires may also be appropriate in some cases.
6. The reinforcing bars in the weir walls should be designed to avoid the screen fixing bolt locations.
7. Some allowance needs to be made for formwork tolerance. We recommend adding an extra 20-40mm to the overall screen width (10-20mm each end). Extra gaps can be filled, but if the weir is cast too short then it can be difficult to remove concrete. The amount of tolerance specified will depend on the size of the screens and the capability of the contractor building the structure. Also ensure that weir and wing walls are cast parallel and that intersections are square.

3.1 Concrete Fixings
Suitable concrete fixings include sleeve or wedge anchors, expansion bolts, chemical (resin) anchors or cast-in sockets. Stainless steel should be used wherever possible to prevent corrosion and to avoid galvanic reaction with the frames.

The choice of fixing chosen depends on local conditions and working practices, and the installation method will vary slightly for each situation. Expansion sockets with round-head bolts provide a good finish with little protrusion of metal into the river flow, although they can trap silt and may need flushing to prevent thread damage. Studding has been used at some sites, but this can catch debris such as grass and leaves. The frame holes are 13mm in
diameter, suitable for M10 or M12 fixings, although M8 fixings have been used in certain circumstances (eg on uneven concrete, or where alignment is difficult).

The frames are strong enough to cope with the static pressure exerted by most flood flows. However, during high flows the water will tend to suck the screens outwards, rather than to squash them – the fixings need to be sufficiently strong to cope with this force. If the site is subject to extreme flood flows with movement of large boulders then installation of the screens out of the main river flow is recommended.

3.2 Design Health & Safety

Points to consider for the design risk assessment process (in addition to those for the general weir construction) include:

1. Screen handling and access to the weir during installation – the screens will need to be carried to the weir, and the larger ones may need to be lifted into position with a digger or similar. Shackles can be attached to the fixing holes if required. Screen weights are given in the table below.
2. Sharp edges – the frame can have sharp edges, so gloves should be worn when handling.
3. Drilling into the concrete for fixing the frames to the weir – standard site H&S precautions should be followed. Note that drilling into the main (upper) weir wall may involve working at height if scaffolding is not in place.
4. Confined spaces – all the installation and fixing can be done from the outside, so no confined spaces access is required under the screens.
5. Access for future maintenance – a flat standing area should be provided at the bottom of the screens to allow inspection, cleaning or maintenance. It should be possible to de-water this area by using a sluice gate or similar. Clip-wires may also be required in certain circumstances.
6. Working near water – general site rules will apply.
7. The only COSHH requirement will be for any anti-seize grease or sealing compound that is used. The screens themselves are made from stainless steel.

For more details, please refer to:
- The Personal Protective Equipment (PPE) at Work Regulations 1992
- The Manual Handling Operations (MHO) Regulations 1992
- The Noise at Work Regulations 1989
- The Control of Substances Hazardous to Health (COSHH) Regulations 2002
- The Work at Height Regulations 2005

4 INSTALLATION

See the separate site installation instruction sheet for single screens (AQS-DOC024) which should be printed out and given to the contractors on site, along with a site-specific risk assessment.

5 MAINTENANCE

The screens are designed to minimise the maintenance requirements for a water intake. Depending upon the particular water conditions at the site, occasional maintenance may be required.

In order to establish the maintenance regime required for a particular installation the screen should be monitored relatively frequently during the first year of operation. A suitable interval
would be monthly visits in most cases. In some cases it can be established that no regular maintenance is required and the intake should be visited for observation only at monthly intervals. In other extreme cases where there is prolific slime or algal growth, or particular types of debris, maintenance or cleaning visits may be required more often – note that this is most likely to be seasonal. In the UK, simply brushing down the screens every month or two is typical.

In some water conditions there can be problems with green slime or algae sticking on the screen material, particularly during hot weather. This can be removed with a stiff brush – a standard yard broom with stiff bristles is suitable. Generally the vast majority of debris can be removed by brushing from the outside. In one case it has been found necessary to clean the underside of the screen at 6-12 monthly intervals to remove peat fibres, which coagulate on the water surface in the sump. The underside of the screen material should therefore be inspected after 3-6 months operation to determine whether regular cleaning will be required at the site.

The vast majority of vegetative debris (leaves and twigs) will be washed off the screens during periods of higher river flow. It may be found that a few pieces of items like pine needles or leaf stems will get stuck between the wedge wires over time. Again, these can be removed using a stiff bristle brush.

Physical damage is a possibility if large boulders or trees are carried down the river during flood conditions. If this is a possibility at the site (e.g. forestry upstream of the intake) then the intake should be visited to check for physical damage after large flood events. In high bed-load situations (such as Alpine regions) the screens should be situated out of the river or have protection bars installed above them.

5.1 Repairs and Replacements
Should there be any physical damage to the screen then the whole unit will need replacement. At sites where there is a high silt load of abrasive material (e.g. quartz) the capacity of the screens will gradually be reduced as the sharp edges of the wedge wire are rounded off. This will reduce the capacity of the screen and eventually it will need to be replaced. Experience has shown that in general it will take around 10 to 15 years for the flow capacity to drop below the rated capacity. However, in some extreme cases (eg Alpine areas) where the silt has a high quartz content this period can be reduced to 5 years or less.

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6 QUALITY
Dulas Hydro have recently been accredited under the ISO 9001:2000 quality management system through SGS. The screens are manufactured in the UK, and the factory is also accredited under ISO 9001:2000 by NQA. Full details are available on request.
# Specification for Single Screens

## Type B – Full Height (1270mm Headloss)

<table>
<thead>
<tr>
<th>Type</th>
<th>Width (mm)</th>
<th>Rated Flow (l/s)</th>
<th>Weight (kg)</th>
<th>Drawing</th>
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<tr>
<td>B-600</td>
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## Type D – Half Height (700mm Headloss)

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<th>Type</th>
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<th>Rated Flow (l/s)</th>
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## Type E – Quarter Height (400mm Headloss)

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<th>Type</th>
<th>Width (mm)</th>
<th>Rated Flow (l/s)</th>
<th>Weight (kg)</th>
<th>Drawing</th>
</tr>
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Photographs

Type B-900

Type B Acceleration Plate

Type B Footplate