

Type 'AB' Air Gaps

Practical Examples and Calculations

This article is aimed at clarifying regulation requirements of Type 'AB' Air Gaps and the new thinking by the Water Companies in their practical application.

The Regulations are quite specific, a type 'AB' Air Gap is, by definition is **unrestricted. i.e. No Screening of the Spill Slot.**

However, as was further explained, due to practical considerations WRAS and the Water Undertakers are now prepared to accept or recommend in certain circumstances, the need to screen a Type 'AB' Spill Slot.

In practice, this will mean, most if not all Type 'AB' Spill Slots will be accepted when provided with appropriate **screening and cowl outlet.**

The onus will still be with the **Tank designer**, for any given duty, to ensure the spill slot size and configuration will be compliant with the Regulations.

The Fundamental's

The determination of a Type 'AA' and 'AB' Air Gaps and spill slot design still rests, at the present time, with BS 6281:Part1:1992 (BS EN 13077). The Specification for the now superseded Type 'A' Air Gap.

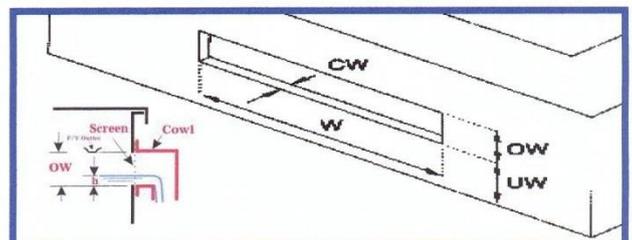
The formula for determining the head of water 'h' discharging over the weir the spill slot is advised as are the other critical parameters related to the slot design.

The ATCM web site www.atcmtanks.org.uk, on its Technical / News page, provides the ATCM "Type AB Air Gap and Spill Slot Calculator" (as shown right) in the form of an Excel Spreadsheet. Inputting tank inlet diameter/s and slot length the Calculator automatically provides the value 'h' for an unscreened slot and minimum slot height.

Calculations valid for single or multiple inlet arrangements if the following conditions are met

- 1 Width W is greater than or equal to 10h at the spillover level.
- 2 Weir crest thickness Cw is less than or equal to 5h
- 3 Upstream face Uw of weir or notch is vertical to a depth of 2h
- 4 The depth of the weir Ow is greater than or equal to 2De+h

All dimensions in mm	Acceptable Weir Sizes		Validation Criteria (see above)			
	W Weir width	Ow (4) Weir height	h	1	2	3
Unrestricted Weir (No Insect Screen)	800	143	31	YES	YES	YES
Increase Weir width W to account for insect screen obstruction	1778	143	31	YES	YES	YES
Increase Slot height Ow to account for insect screen	800	165	53	YES	YES	YES



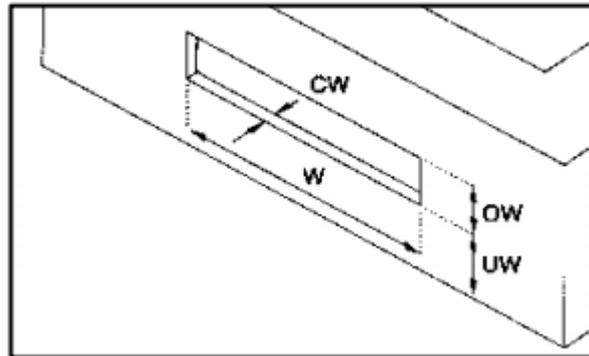
Additionally it advises i) for the same value of 'h' the required increased slot length for a screen with a particular % free area or ii) for the same slot length the increase required in 'h'.

The calculated results are only valid if the Validation's 1 to 4 are met.

Practical Guidance

From a design and manufacturing viewpoint limit the options available.

Consider adopting only two spill slot lengths suited to a specific tank range. In the examples below 400mm and 800mm have been selected as 'W'. Choose a reasonable maximum value for 'h', say 20mm for inlets up to and including 32mm for the smaller slot and 50mm for the larger inlets and slot size. This approach will provide compact and economical designs.



Example Calculations

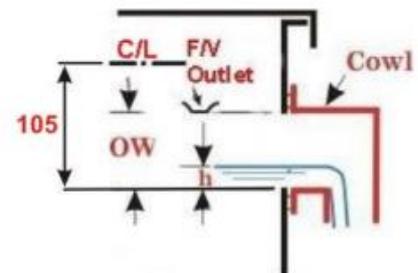
- 1) Determine relative inlet centreline level (c/l) of a 25mm dia. Equilibrium F/V above the weir sill level of a Type 'AB' 400mm long Spill Slot (a - unscreened and b - screened.)

a) Unscreened Slot

'h' = 17mm

'OW' min. slot height = 67mm (2 x F/V dia. + head over weir)

Equilibrium Float Valve inlet centreline is 1.5 x F/V dia. above its discharging outlet = 1.5 x 25 = 38mm.
Therefore, F/V c/l is ('OW' + 38) = 105mm above weir sill level.



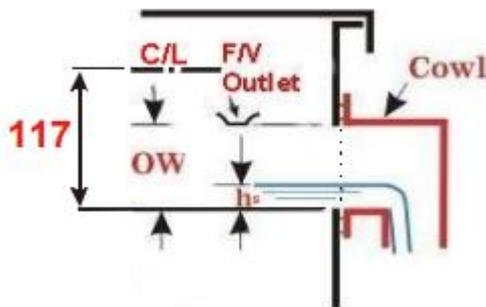
b) Screened Slot

If this 400mm long Spill Slot is fitted with a 45% Free Area Screen the value of 'h' will require to increase.

The Calculator provides the value of 'hs' = 29mm or the following formula advises how this is derived.

$$h_s = h \times (100 / \%Free\ Area)^{2/3}$$

Therefore 'h' increases until the same flow to passes through the screen. In this instance 'h' requires to increase to:



$$h_s = 17 \times (100 / 45)^{2/3} = 29\text{mm}$$

Consequently F/V c/l is required to be positioned 117mm above weir sill level.

Remember, 'OW' (spill slot height) requires to be increased to 79mm and is given by 2 x F/V dia. + head 'hs' over weir.

For other typical inlet and slot size examples the following can be determined.

2) F/V = 50mm dia., Slot length = 800mm

Therefore –

'h' (unscreened) = 27mm
 'OW' = 127mm.
 F/V c/l to weir sill level = 202mm

For Slot with 45% free area screen

'hs' (screened) = 46mm
 'OW' = 146mm
 F/V c/l to weir sill level = 221mm



3) F/V = 100mm dia. Slot length = 800mm

Therefore

'h' (unscreened) = 68mm

'OW' = 268mm.

F/V c/l to weir sill level = 418mm

For Slot with 45% free area screen

'hs' (screened) = 116mm

'OW' = 316mm

F/V c/l to weir sill level = 466mm

In this latter Screened Slot example the minimum requirement for the slot length of **10 x hs (1160mm)** is not met by a single 800mm weir slot. It is therefore a non-compliant design. It is recommended 2 x 800mm wide slots be employed.

In example 3) a further benefit is obtained if **2 x 800mm long Spill Slots** are employed. The values of 'h' and 'hs' would reduce to 43 and 73mm with the effect of **raising the TWL by some 25 and 43mm respectively and if tank surface area is large compared to its depth, considerably increases the volume of water stored.**

Note: The above information is advisory only.

*Author: Ian McCrone BSc. CEng. MI Mech E
Past Chairman of ATCM*

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