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Critical

Submergence At

**Critical Submergence At Vertical Pipe Intakes Vortex Breaker**

**Intakes**

**Vortex**

**Breaker**

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at vertical pipe**

**intakes vortex**

**breaker** after that it is not directly done, you could say yes even more a propos this life, around the world.

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**Critical  
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Vertical Pipe**

Critical submergence is  
a function of factors  
besides the vertical

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distance and the acceleration of gravity. Other factors are surface tension, viscosity, density and the diameter of the suction pipe opening, especially if there is a transition to a smaller-diameter pipe shortly after the initial opening.

**Guidelines for  
Submergence & Air  
Entrainment | Pumps  
& Systems**

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### Critical

### Submergence At

For a vertically downward flowing intake, critical submergence is defined as the vertical distance between the intake center and water surface level when air just enters the intake by a free-surface vortex.

However, for a horizontally flowing intake air enters the intake at the summit point of the intake.

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**Critical**

**submergence for a  
horizontal pipe  
intake ...**

The present paper deals with the effect of circulation and other flow parameters affecting the critical submergence at vertical pipe intakes drawing water from reservoirs and streams for hydropower and pumping plants. Examination of data collected...

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The critical submergence for a vertically downward flowing pipe intake in a two-layer stratified fluid field is defined as the vertical distance of the interface of the fluid layers to the intake...



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**submergence for a  
horizontal pipe**

**intake**

CONCLUSIONS For reducing the critical submergence depth at vertical pipe intakes and omitting the swirling ow, anti-vortex plates can be used. Equation 5 can be used while knowing ow conditions (Nand FN), required submergence depth (Figure 6), pipe diameter and

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symmetrically  
positioned plate

positions.

**E**ct of **A**nti-**V**ortex

**P**lates on **C**ritical

**S**ubmergence at a ...

Critical submergence is

the depth just before

the vortex formation

starts. In other word,

vertical distance

between the free

surface and the intake

(Center of the intake,

$Sc^*$  or top of the

intake,  $Sc$ ).

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**Determination of  
Submergence Depth  
to Avoid Vortices at  
Breaker**

The vertical distance between the water level and upper level of intake is generally called submergence. Due to insufficient submergence of the intake, air enters the intake pipe and reduction in discharge takes place. The submergence depth at

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which incipient air entrainment takes place at the pipe intake is called critical submergence.

### **Prediction of Critical Submergence for Horizontal Intakes**

A. This answer provides the recommended minimum submergence of a vertical pump inlet bell to reduce the probability that strong free-surface air core

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vortices will occur.  
Submerged vortices  
are not believed to be  
related to  
submergence.

## **How to Determine Minimum Submergence | Pumps & Systems**

Critical submergence in  
pumping systems can  
be determined using a  
number of calculations,  
all of which result from  
heterogeneous  
geometries based on

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water. The most widely spread critical submergence formula is that of the Hydraulic Institute.

## **Determining Critical Submergence in Tanks by Means of**

...

Horizontal and Vertical Intake Designs (note, inverted vertical intake not shown).  $D$  represents the pipe diameter,  $D_o$  ...  $D$  represents the pipe

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diameter,  $D_o$ . ... The term critical submergence ( $S_c$ ) was defined by Jain et al. (1978) as the ...

**Intake Vortex  
Formation and  
Suppression at  
Hydropower ...**

times the critical submergence of the intake) can also be used to predict the critical submergence. The agreement between theoretical

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results and available experimental data indicates that this critical spherical sink surface gives good results especially for the intake when the distance of the impervious vertical dead-end wall to the center point ...

### **Prediction of critical submergence for an intake pipe ...**

The minimum submergence of a



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pump is the vertical distance of liquid above the suction bell, inlet, or line required to avoid the creation of a vortex. If the vortex with it's tornado-like, spinning movements like a whirlpool go deep enough it can cause cavitation in the pump.

### **How to Calculate Minimum Submergence**

As a broad rule of

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thumb, the Froude  
Number for vertical  
downflow service  
should be less than 0.3  
to avoid air

entrainment- ie vapour

bubbles will rise and

the pipe will be self

venting. For fully

flooded vertical

downflow, the Froude

number should be

greater than 0.6. BRIS

(Civil/Environmental)

11 Feb 04 02:50

**Air entrainment /**

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**Vortice formation -  
Pipelines, Piping ...**

The critical submergence for a group of multiple pipe intakes is predicted using a "superposition method" based on a potential flow solution. Experiments on groups of two, three, and four intakes were conducted.

Experimental and theoretical results indicate that intakes in a group mutually

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influence the discharge  
into an individual  
intake.

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**Submergence for  
Multiple Pipe  
Intakes | Journal ...**

By experimental findings, the critical submergence for a simple vertical intake is formulated as: (6)  
Where the Froude number is limited from 0.68 to 2.86 and the  $R_2$  from the equation 7 is

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0.95. Four different types of plates were installed on the simple vertical intake and the relevant results are shown in figures 7 to 9.

### **Discharge Coefficient in Vertical Intakes with Additional ...**

Comparing the experimental results to a vertical pipe intake indicated that the critical submergence is somewhat reduced for

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**(PDF) Effect of Anti-Vortex Plates on Critical Submergence ...**

and (2) suction source. Critical consideration must be given to both in order to properly design an efficient system. Proper suction piping design and installation

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considerations consist of pipe and pipe fittings and their relationship, quantity, and relative location to the pump suction nozzle. Suction source design

## **Practical Considerations in Pump Suction Arrangements**

The test facility used in the present study consists of a cylindrical tank with 1 m inner

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diameter and 0.8 m height. The flow discharges through a vertical pipe intake of 0.35 m high and two different diameters of 7.5 and 10 cm at the center of the tank

(.). The test sequence started from the maximum allowable flow (roughly 10 l/s) and, afterwards, the flow was incrementally decreased to a ...

**Effects of anti-**

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**vortex plates on air  
entrainment by free**

Vertical Pipe

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Critical Submergence  
At Vertical Pipe A more  
important term is  
required submergence,  
also known as  
minimum or critical  
submergence (SC).

Required submergence  
is the vertical  
distance—from the  
fluid surface to the  
pump inlet—required  
to prevent fluid  
vortexing and fluid

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rotation (swirling and  
or pre-swirl).

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