

# **Hydraulics 3 Laboratory: Open-Channel Flow**

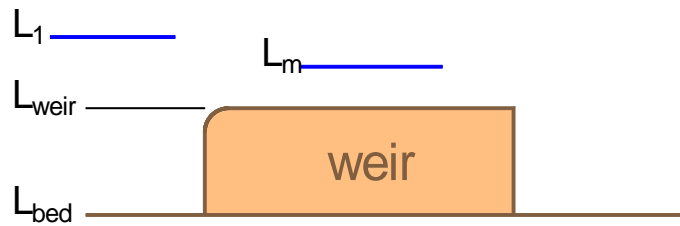
**Student name:**

**Date:**

## Part 1: Broad-Crested Weir

### Raw Data

Channel width,  $b$ : \_\_\_\_\_ mm

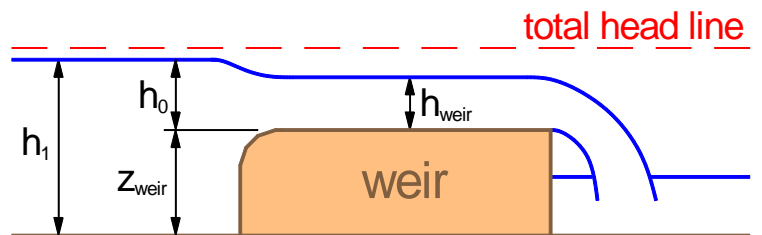


| Levels from point gauge |                    |               |               | Water collection |             |
|-------------------------|--------------------|---------------|---------------|------------------|-------------|
| $L_{bed}$<br>(mm)       | $L_{weir}$<br>(mm) | $L_1$<br>(mm) | $L_m$<br>(mm) | Volume<br>(L)    | Time<br>(s) |
|                         |                    |               |               | 30               |             |
|                         |                    |               |               | 30               |             |

### Analysed Results

Channel width,  $b$ : \_\_\_\_\_ m

Height of weir,  $z_{weir}$ : \_\_\_\_\_ m



| Measurements |                   |              |                         | Critical depth<br>(eq. (1)) | Ideal discharge<br>(eq. (2))    | Discharge coefficient<br>(eq. (3)) |
|--------------|-------------------|--------------|-------------------------|-----------------------------|---------------------------------|------------------------------------|
| $h_1$<br>(m) | $h_{weir}$<br>(m) | $h_0$<br>(m) | $Q$<br>( $m^3 s^{-1}$ ) | $h_c$<br>(m)                | $Q_{ideal}$<br>( $m^3 s^{-1}$ ) | $c_d$                              |
|              |                   |              |                         |                             |                                 |                                    |
|              |                   |              |                         |                             |                                 |                                    |

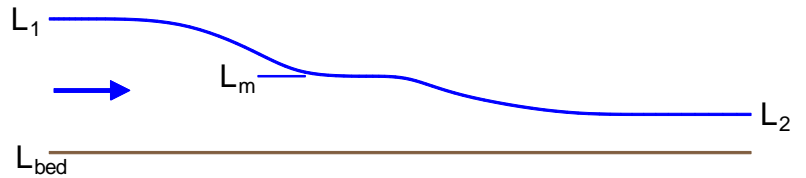
### Questions For Consideration (No submitted answers required)

Where do we expect the flow to have critical depth  $h_c$ ? Is this observed?

## Part 2: Venturi Flume

### Raw Data

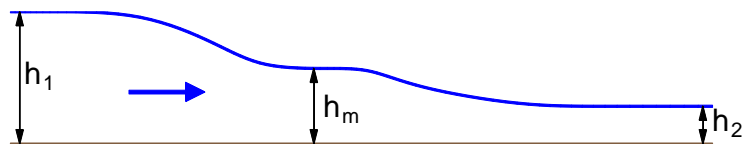
Channel width,  $b$ :  mm  
 Throat width,  $b_{min}$ :  mm



| Levels from point gauge |               |               |               | Water collection |             |
|-------------------------|---------------|---------------|---------------|------------------|-------------|
| $L_{bed}$<br>(mm)       | $L_1$<br>(mm) | $L_m$<br>(mm) | $L_2$<br>(mm) | Volume<br>(L)    | Time<br>(s) |
|                         |               |               |               | 30               |             |
|                         |               |               |               | 30               |             |

### Analysed Results

Channel width,  $b$ :  m  
 Throat width,  $b_{min}$ :  m



| Discharge<br>$Q$<br>( $m^3 s^{-1}$ ) | Water depths |              |              | Velocities              |                         |                         | Froude numbers |        |        | Total head   |              |
|--------------------------------------|--------------|--------------|--------------|-------------------------|-------------------------|-------------------------|----------------|--------|--------|--------------|--------------|
|                                      | $h_1$<br>(m) | $h_m$<br>(m) | $h_2$<br>(m) | $V_1$<br>( $m s^{-1}$ ) | $V_m$<br>( $m s^{-1}$ ) | $V_2$<br>( $m s^{-1}$ ) | $Fr_1$         | $Fr_m$ | $Fr_2$ | $H_1$<br>(m) | $H_2$<br>(m) |
|                                      |              |              |              |                         |                         |                         |                |        |        |              |              |
|                                      |              |              |              |                         |                         |                         |                |        |        |              |              |

### Questions For Consideration (No submitted answers required)

Is a subcritical to supercritical flow transition observed?

Did critical conditions occur at the throat? If not, suggest reasons why not.

Is total head conserved through the device? If not, suggest reasons why not.

### Part 3: Gate

Provide annotated sketches of the water level in the channel for horizontal and sloping beds with both weir and gate in place. Make sure that you label any hydraulic jump, and mark where the flow is subcritical, critical or supercritical.

- Sketch for horizontal bed

- Sketch for sloping bed