# *EWCE 462*
# *SPRING 2026*

# *Steady Flow Modeling: Modeling Water Surface Profile with a Broad Crested Weir in Rectangular and Trapezoidal Channels*

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# Broad Crested Weir

- ***Broad crested weir***, a hydraulic structure, is widely used in open channel flow as a discharge measuring structure.
- Flow is obstructed by the structure and a critical depth is attained on the structure.
- Based on the upstream depth above the crest level, flow over a broad crested weir can be calculated based on the following formula:

$$Q = \left(\frac{2}{3}\right)^{3/2} B\sqrt{g}H^{3/2} \qquad (1)$$

# *Objective of this lab*

- In this lab, our main objectives are to understand the effect of **transcritical flow** and to be familiar with different components of HEC-RAS. Therefore, in this lab we will simulate water surface profile with a broad crested weir.

# Specific Objectives:

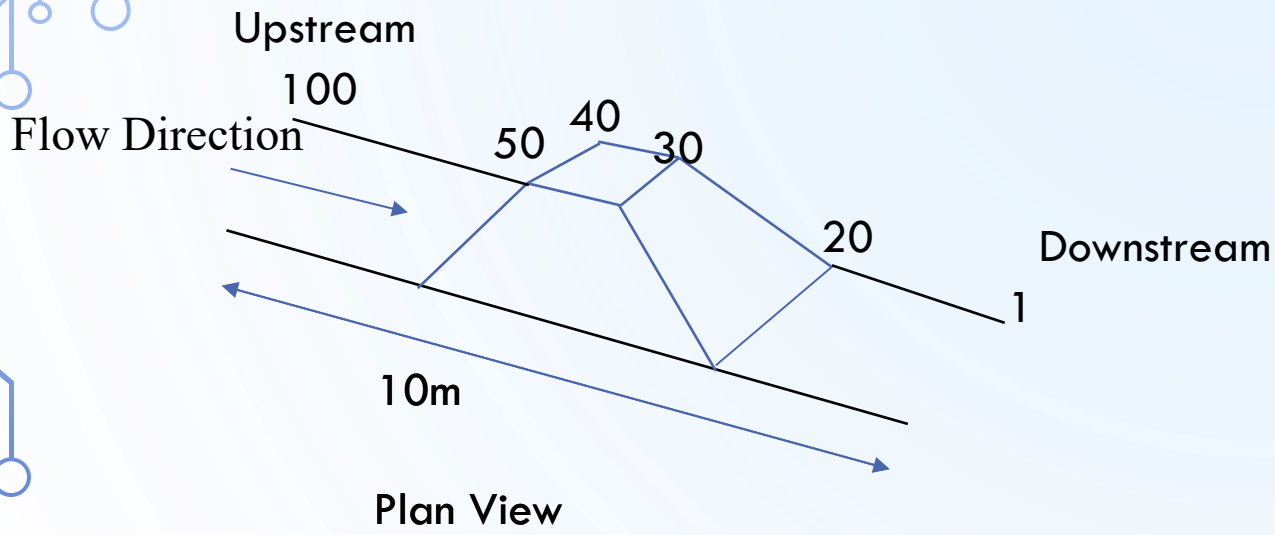
| | |
|---|---|
| Generate | Generate a broad crested sbed profile in excel using the given information. |
| Create | Create a new project. |
| Draw | Draw a schematic of a straight river. |
| Assign | Assign cross section data. |
| Assign | Assign boundary condition data. |
| Perform | Perform the analysis. |
| View and present | View and present the results. |

# *Classwork 01*

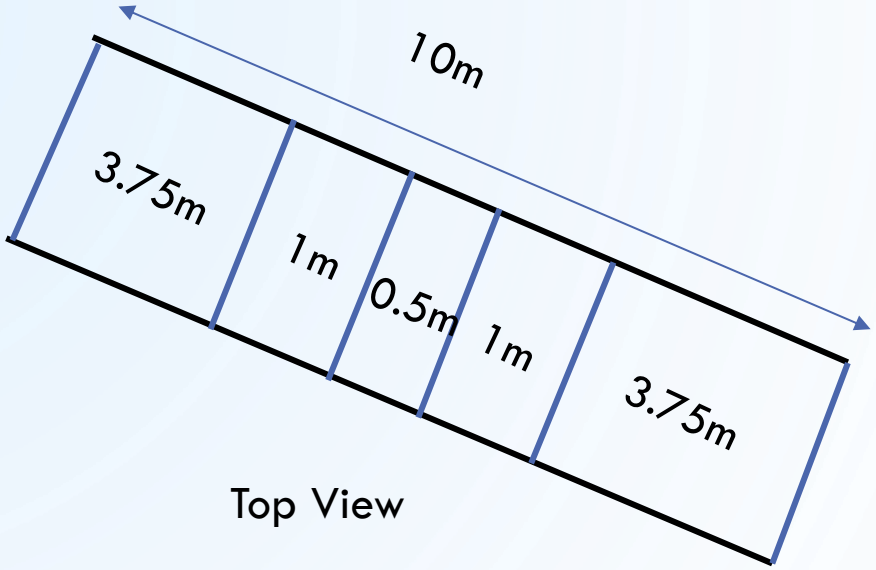
***Given Information:***

- The channel is rectangular.
- The channel width is 1 m.
- The channel length is 10 m.
- The channel depth is 1.5 m.
- Manning's n can be assumed as 0.01 $s/m^{1/3}$.
- The discharge in the channel is 0.2 $m^3/s$.
- Hump height = 0.25 m
- The downstream boundary condition is = 0.28 m
- The upstream boundary condition is = 0.3 m

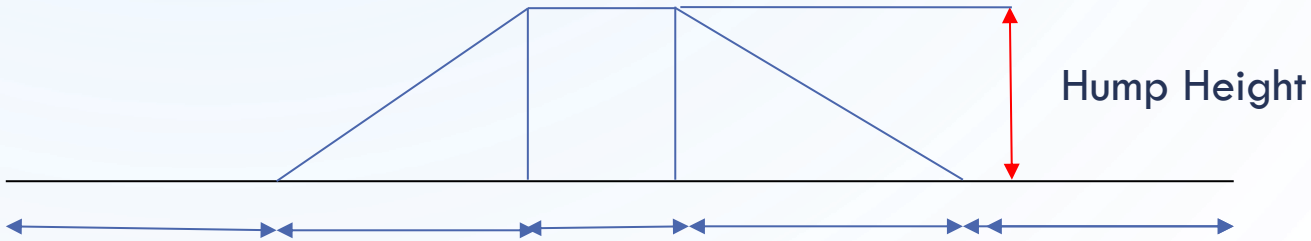
# BROAD CRESTED WEIR




Plan View

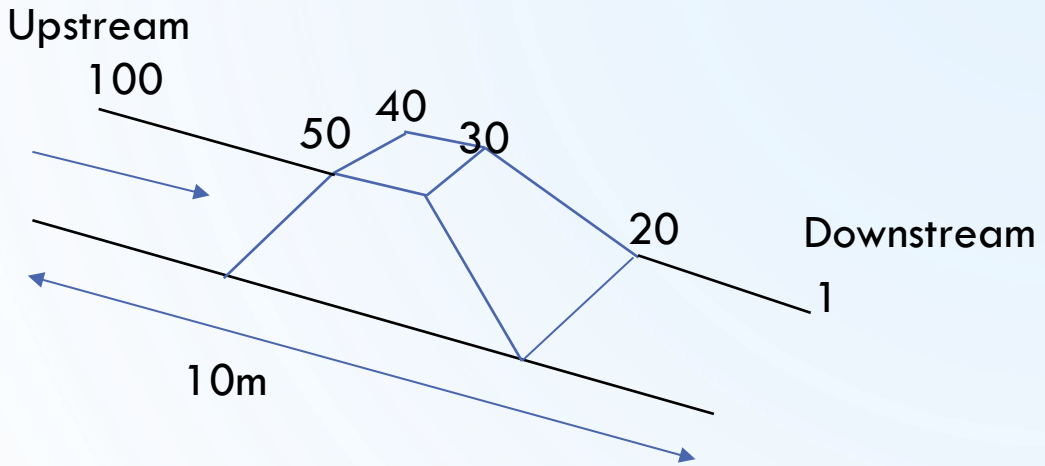



Top View

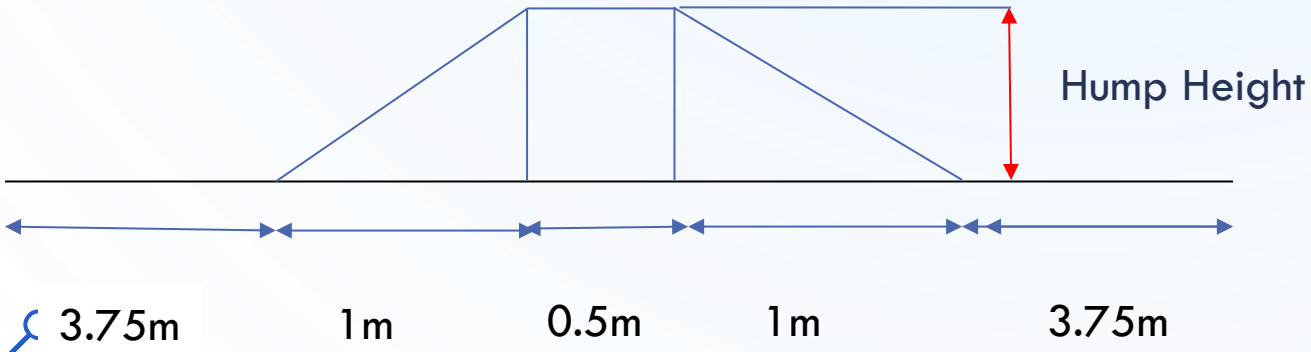


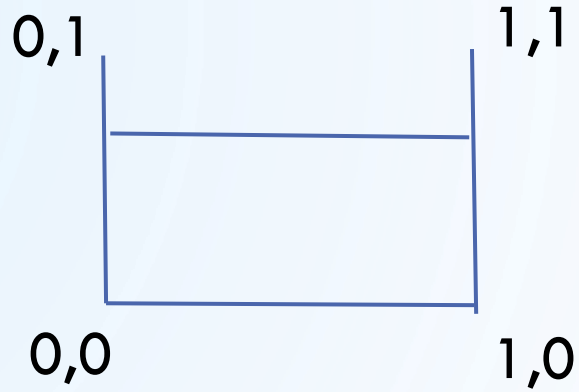

3.75m 1m 0.5m 1m 3.75m

# BROAD CRESTED WEIR

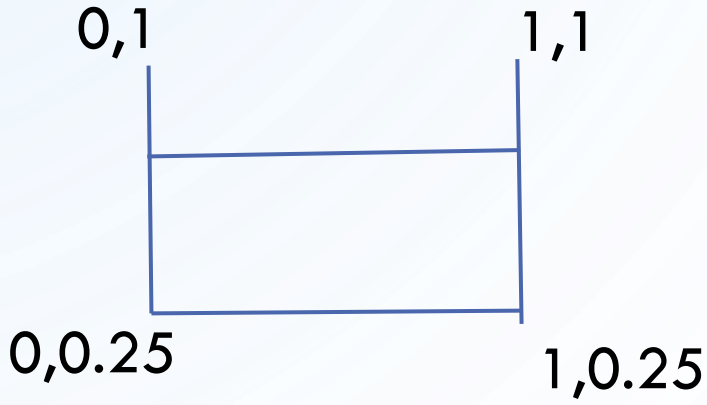



Plan View




Station 100,50,20 and 1



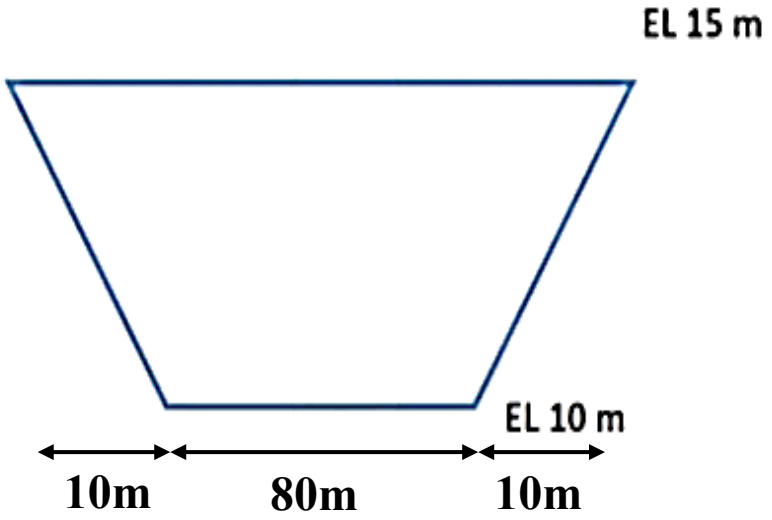

Station 40 and 30

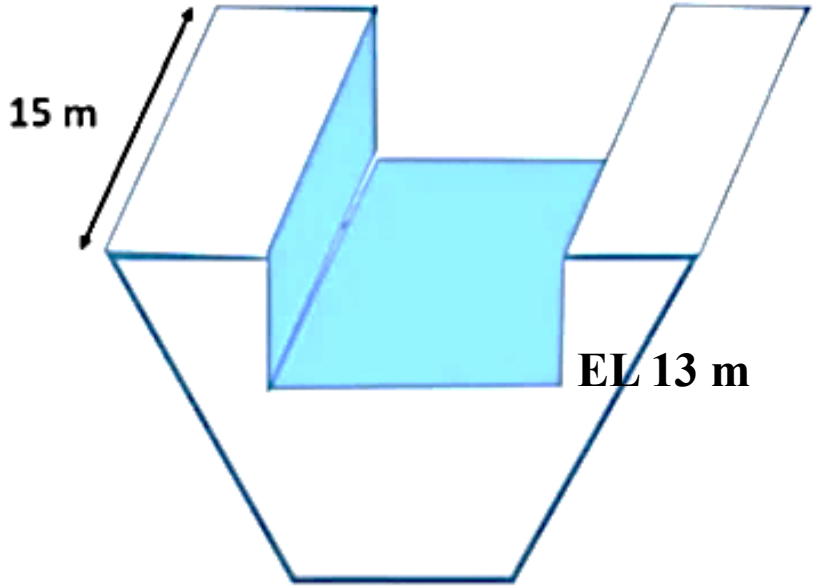
# *Classwork 02*

***Given Information:***

- The channel is trapezoidal.
- The bottom width of the channel is 80 m.
- The channel length is 1000 m.
- Manning's n can be assumed as 0.025 $s/m^{1/3}$.
- The channel slope= 0.001
- Upstream and downstream boundary condition = normal depth=channel slope.
- The side slope of the weir in upstream = 1.5
- The side slope of the weir in downstream = 2
- Discharge = 150 $m^3/s$

# *Classwork 02*




****The broad crested weir is constructed 490m away from the downstream.**

# *Problem 01*

***Given Information:***

- The channel is rectangular.
- The channel width is 1 m.
- The channel length is 10 m.
- The channel depth is 1.5 m.
- Manning's n can be assumed as 0.01 $s/m^{1/3}$.
- The discharge in the channel is 0.2 $m^3/s$.
- Hump height = (Last two digits of your student number + 10)/100
- The downstream boundary condition is = (Hump height +0.03) m
- The upstream boundary condition is = (Hump height +0.05) m

# *Problem 02*

***Given Information:***

- The channel is trapezoidal.
- The bottom width of the channel is 80 m.
- The channel length is 1000 m.
- Manning's n can be assumed as 0.025 $s/m^{1/3}$.
- The channel slope= last two digits of your student number/1000
- Upstream and downstream boundary condition = normal depth=channel slope.
- The side slope of the weir in upstream = 1.5
- The side slope of the weir in downstream = 2
- Discharge = (150+Last two digits of your student number ) $m^3/s$

# *Submissions*

## *Problem 01:*

*Run the simulation by installing the broad crested weir using -*

*i. inline structure*

*ii. cross section*

***For both cases:***

1. Calculate upstream depth using equation 1 and compare it with your model result.
2. Calculate the analytical critical depth for your case and compare it with your model result.
3. Printing of longitudinal profile of water surface elevation.
4. Printing of longitudinal profile of Froude number.
5. What will happen if downstream depth is increased? Explain with model simulation results.
6. Discussions.

# *Submissions*

## *Problem 02:*

1. Printing of longitudinal profile of water surface elevation.
2. Printing of longitudinal profile of Froude number.
3. Printing of output table.
4. Discussions.