

Tests 6A and 6B – Dam break

1. Modelling performance tested

This tests the capability of each package to correctly simulate hydraulic jumps and wake zones behind buildings using high-resolution modelling.

2. Description

This dam-break test case has been adapted from an original benchmark test case available from the IMPACT project (IMPACT, 2004; Soares-Frazao and Zech, 2002), for which measurements from a physical model at the Civil Engineering Laboratory of the Université Catholique de Louvain (UCL) are available.

Test 6A is the original test proposed in Soares-Frazao and Zech 2002, where the physical dimensions are those of the laboratory model. The test involves a simple topography, a dam with a 1m wide opening, and an idealised representation of a single building downstream of the dam, see Figure (a). An initial condition is applied, consisting in a uniform depth of 0.4m upstream from the dam, and 0.02m downstream from the dam. The flow is contained by vertical walls at all boundaries of the DEM.

Test 6B is identical to Test 6A although all physical dimensions have been multiplied by 20 to reflect realistic dimensions encountered in practical flood inundation modelling applications.

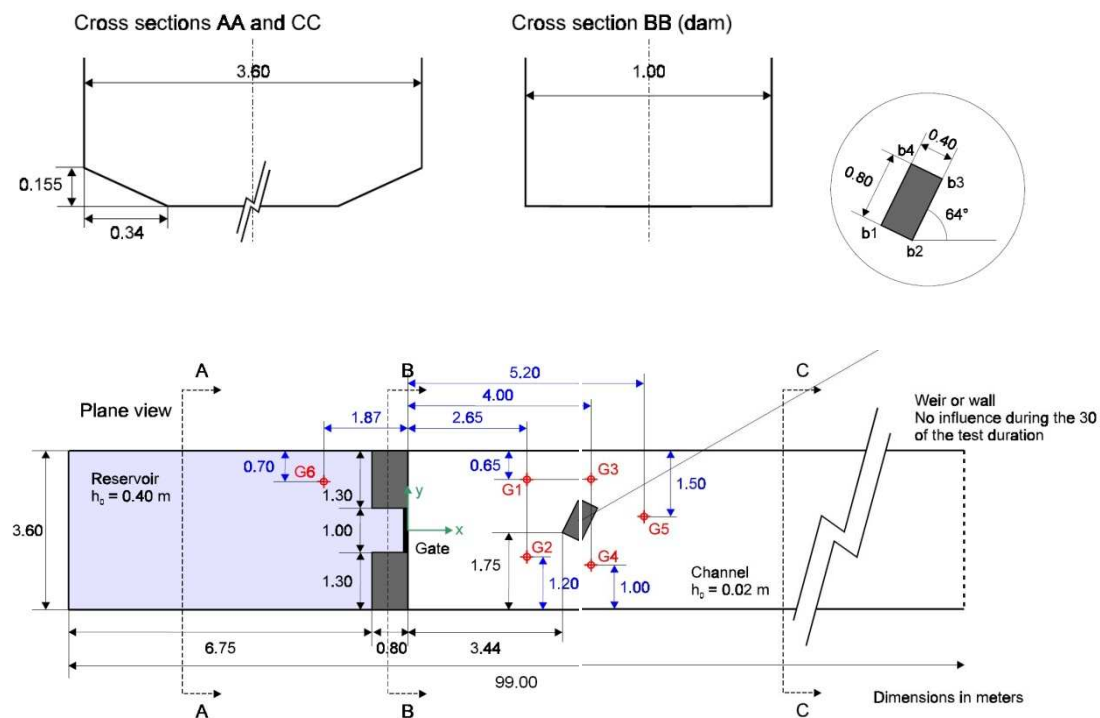


Figure (a): Set-up for Test 6A (adapted from Soares-Frazao and Zech, 2002).

3. Boundary and initial conditions

No boundary condition specified as the flow is contained by vertical walls.

Initial condition:

- In Test 6A:** Depth = 0.4m upstream from the dam, i.e. for $X < 0$
Depth = 0.02m downstream from the dam, i.e. for $X > 0$
- In Test 6B:** Depth = 8m upstream from the dam, i.e. for $X < 0$
Depth = 0.4m downstream from the dam, i.e. for $X > 0$

4. Parameter values

No preferred value of the eddy viscosity is specified.

In Test 6A:

Manning's n : 0.01 (uniform), as specified in Soares-Fraza and Zech, 2002.

Model grid resolution: 0.1m

(or ~36000 nodes in area bounded by vertical walls)

Time of end: the model is to be run until time $t = 2$ min (if an alternative end time is used run times must be reported for $t=2$ min)

In Test 6B:

Manning's n : 0.05 (uniform).

Model grid resolution: 2m

(or ~36000 nodes in area bounded by vertical walls)

Time of end: the model is to be run until time $t = 30$ min (if an alternative end time is used run times must be reported for $t=30$ min)

5. Required output

Software package used: version and numerical scheme.

Specification of hardware used to undertake the simulation: processor type and speed, RAM.

Minimum recommended hardware specification for a simulation of this type.

Time increment used, grid resolution (or number of nodes in area modelled) and total simulation time to specified time of end.

Value of eddy viscosity coefficient used.

From Test 6A:

Plots of the **water level** elevation versus time and **velocity** (scalar) versus time at locations G1 to G6 in Figure (a). Output frequency 0.1s. Coordinates provided as part of dataset.

Raster grids (or TIN) at the model resolution consisting of:

- a. **Peak water elevations** reached during the simulation
- b. **Peak velocities** (scalar) reached during the simulation
- c. **Water elevation at times** 1, 2, 3, 4, 5, 10, 15, 20, 25 and 30 seconds.

From Test 6B:

Plots of the **water level** elevation versus time and **velocity** (scalar) versus time at locations G1 to G6 in Figure (a). Output frequency 1s. Coordinates provided as part of dataset.

Raster grids (or TIN) at the model resolution consisting of:

- d. **Peak water elevations** reached during the simulation
- e. **Peak velocities** (scalar) reached during the simulation
- f. **Water elevation at times** 1, 2, 3, 4, 5, 10, 15 and 20 minutes.

6. Dataset content

Description	File Name
Georeferenced Raster ASCII DEM at resolution 0.05m for Test 6A	Test6ADEM.asc
Georeferenced Raster ASCII DEM at resolution 1m for Test 6B	Test6BDEM.asc
Location of output points for Test 6A	Test6Aoutput.csv
Location of output points for Test 6B	Test6Boutput.csv

7. Additional comments

Participants are asked to provide model results **at least** for the grid resolution specified above.

Model results for one alternative resolution or mesh may also be provided.

Participants are asked to justify their reasons for not carrying out the test, or for carrying out the test using an alternative resolution.

8. References

IMPACT, 2005 Investigation of Extreme Flood Processes and Uncertainty. Final Technical Report.

SOARES-FRAZAO, S. AND ZECH, Y., 2002 Dam-break flow experiment: The isolated building test case. Available online at: http://www.impact-project.net/wp3_technical.htm