Figure 1 Glass sided tilting flume

DESCRIPTION

Experimental flumes serve as valuable tools for both teaching and research, enabling the study and demonstration of essential open-channel flow phenomena on a laboratory scale. They offer insights into various aspects, including flow regulation through control structures and diverse flow measurement techniques.

It boasts a closed water circuit and an experimental section. This section's side walls are constructed from tempered glass, ensuring excellent visibility during experiments. To maintain durability, all components in contact with water are corrosion-resistant.

The inlet design minimizes turbulence when introducing flow into the experimental section. The flume's inclination is also adjustable, enabling the simulation of slopes and the creation of uniform flow at a consistent depth. Sturdy structure with a shaker plate.

A range of experiment-enhancing accessories, also available. These accessories can be easily and securely attached to the experimental section's base, allowing for a comprehensive set of experiments. The experimental flume is equipped with a comprehensive range of functions for measurement, control.

FEATURES

- Floor standing unit
- Basic principles of open-channel flow
- The channel bed is rests on a beam under frame
- Experimental flume with experimental section, inlet and outlet element and closed water circuit
- smoothly adjustable inclination of the experimental section
- side walls of the experimental section are made of tempered glass for excellent observation of the experiments
- all surfaces in contact with water are made of corrosion-resistant materials: stainless steel, glass reinforced plastic etc.
- flow-optimized inlet element for low-turbulence entry into the experimental section
- closed water circuit with water tanks, pump

- The channel bed is rests on a beam under frame
- Open channel is supplied with water tanks as supply and drain tanks
- **Civil work for Flume base mounting included** (complementry)
- Inlet section with **honey comb** is installed to streamline the inlet water. (complementry)

SPECIFICATION

Experimental section

- Effective Length: 10 metres
- W x H: 400mm x 500mm
- Walls: Toughened/Tempered glass over full length
  - Material:Glass
  - Thickness: 10mm
  - Side wall stability: < 1.0 mm (typically) at 475mm water depth
- Flume Bed
  - Material: Stainless Steel 304
  - Bed stability: <1.0 mm (typically) at 475mm water depth

Inclination

- Adjustment: -0.3° to 0° (complementry) and 0° to +2.4°
- Motorized inclination
- Controlled from touch screen

Pump

- Max. flow rate: 108 m^3/hr
- Max. head: 55m
- Flow measurement: Digitally display

Water reservoir tanks

- Material: Reinforced plastic.
- Storange tank capacity: 1550 Liters

Pressure Distrubution Manometer

- Electronic pressure transducer for measuring and diplay of water level on Software
- Measuring ranges
  - Pressure: 10x 0… 100mbar

Tube Manometer

- Tube manometer:10x 100…500mmWC

SOFTWARE & COMPUTER

System for Data Acquisition and Automation:

This system includes pump speed control, tilt adjustment, pressure distribution display, and a computer interface unit for real-time data acquisition. It is equipped with software for full automation and control via **Touch Screen** computer.

The PC specifications are as follows:

- Processor: Core i9, 13th generation
- RAM: 64GB

- Screen: **32 inches Touch Screen** (complementry)
- Storage: 1TB SSD

Additionally, a power extension with a 7/36 wire, at least 20 feet long, is provided for connecting the computer to the flume system.

Control panel

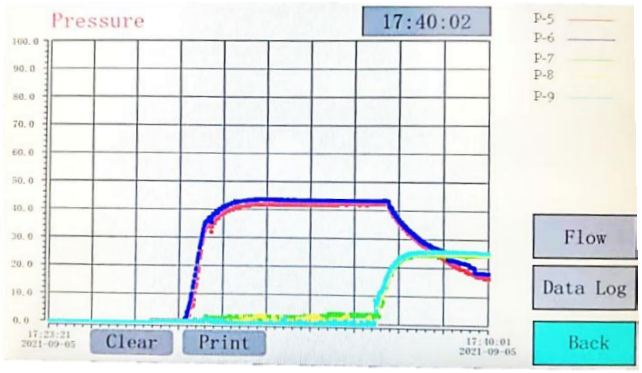
- Act like the brain of the Flume apparatus
- All the electronic thing controlled through it, i.e. pump speed, wave generator, pressure transducer, inclinometer, inclination motor, flow meter etc.
- An emergency button is provided
- Computer interface unit for key data acquisition and software for control by computer

Software

- Adjust Flow rate:
  - Touch the flow rate reading value and input the desired values in m^3/hr
- Adjust Inclination
  - Enter the positive or negative value
  - Press the arrow to lift it up /down
    - Red arrow (upward) for positive slope
    - Green arrow (downward) for negative slope
- Adjust Wave Generator
  - Input its parameter
  - Can create the steady and unsteady waves
  - Generation of surface waves via paddle swinging back and forth
  - Drive of the paddle via crank mechanism and motor with gearbox
  - Motor with variable speed via frequency converter
  - Stroke of the crank mechanism manually infinitely adjustable
  - Frequency of the crank mechanism continuously adjustable via touch screen of
  - Two wave absorbers reduce the reflection of waves

GRAPH

- Display these graph and saves them



DIMENSIONS

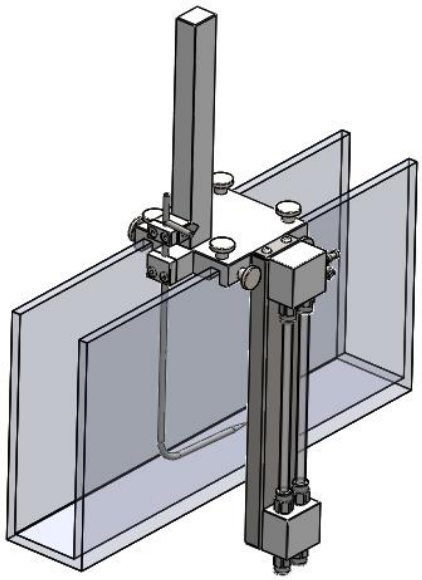
L x W xH: (12 x 0.7 x 1.5) m

ACCESSORIES

The apparatus comes with a selection of compatible accessories, including:

1) Pitot tube with manometer board

Tubes are in stainless steel and mounted on a supporting body with scale. They are supplied with a watertight gland for installation below water level.
In order to measure velocity, the Pitot tubes must be connected to a manometer



2) Two Vernier level gauges (Hook and point gauges)

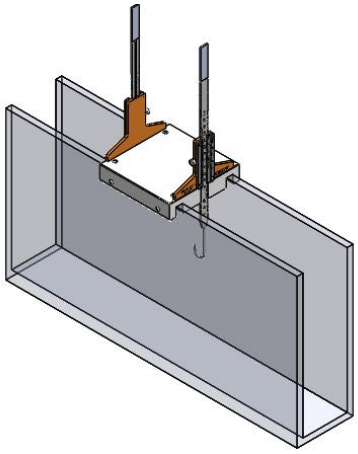
Point Gauge (Stainless steel)

a. Ranges:
    i. 500mm
    ii. Resolution: ±0.1mm

Hook Gauge (Stainless steel)

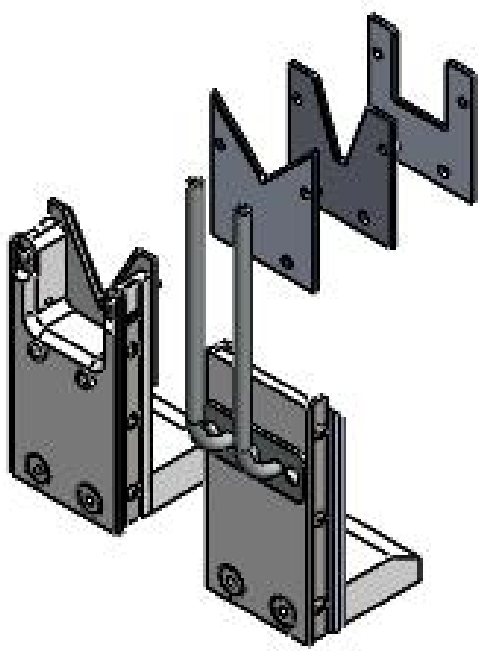
a. Ranges:
    i. 500mm
    ii. Resolution: ±0.1mm

Instrument carrier module for Point Gauge and Hook Gauge attachment on instrument carrier



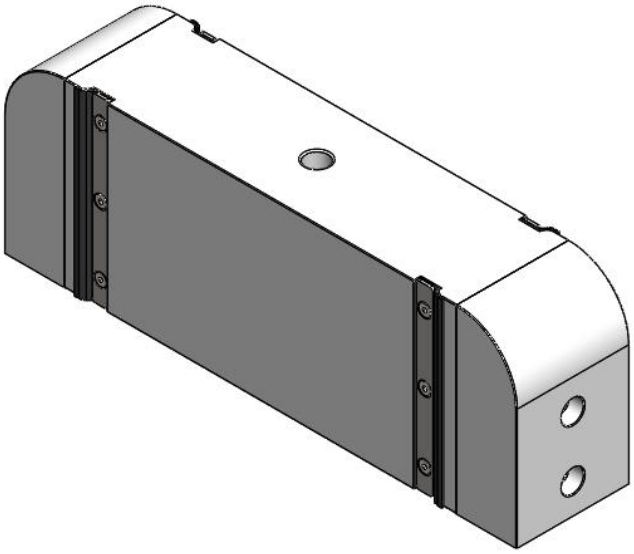
3) Flow splitters Weirs with a central wall and various nose pieces

b. Thomson weir
    i. Triangular weir opening (Stainless steel)
        1. 60° V-notch Weir
        2. 90° V-notch Weir (complementry)
c. Rehbock weir (Stainless steel)
    i. Rectangular weir opening
d. Cipoletti weir (Stainless steel)
    i. **Trapezoidal** weir opening
e. LxWxH: 200x397x400mm Approx. (holder)
f. LxWxH: 200x397x400mm Approx. (rectangular weir)
g. Sharp crested weir with aeration pipe (Stainless steel) (complementry)



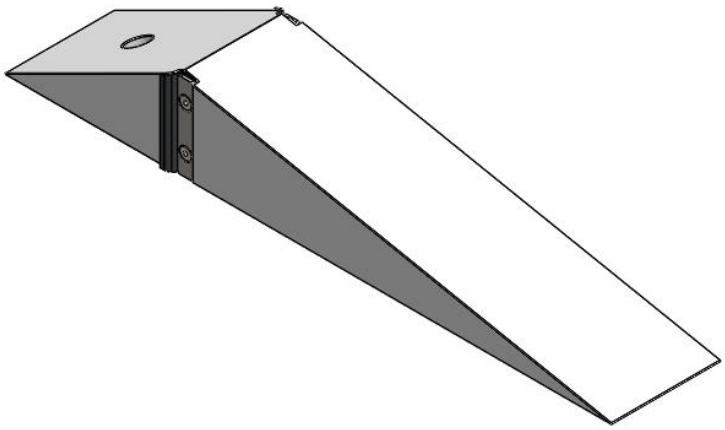
4) Sharp and Broad Crested Weirs

a) Weir body
   i. material: PVC
b) LxWxH: 650x397x250mm Approx. (Sharp edge weir body)
c) LxWxH: 75x397x250mm Approx. (2x Rounded edges weir elements)



5) Crump Weir

a) Weir body
   i. made of PVC
b) inclination (upstream): 1:2
c) inclination (downstream): 1:5
d) LxWxH: 530x397x70mm



6) Ogee Weir

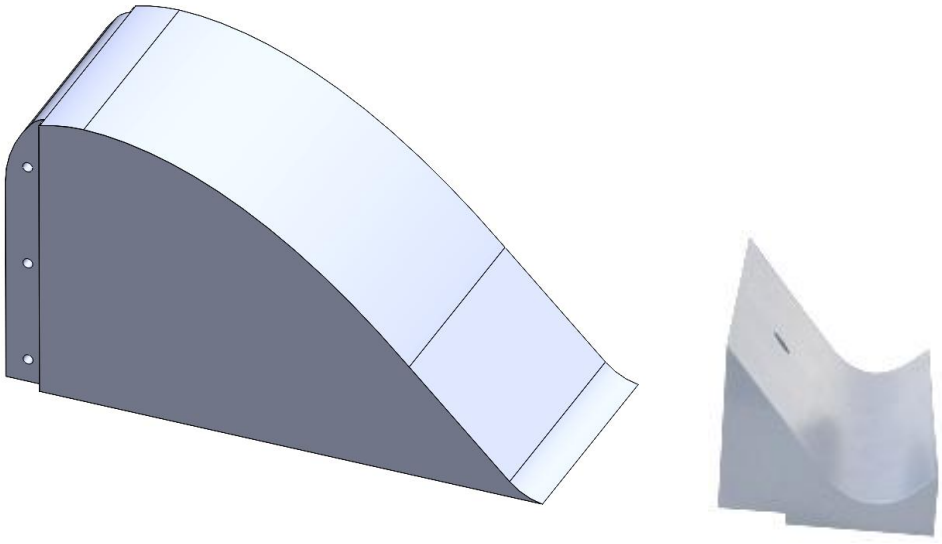
a) ogee-crested weir for the experimental flum
b) 2 different weir outlets: chute and chute with ski jump
c) weir body made of PVC
d) weir body with sealing lips

Weir with chute

- LxWxH: 410x397x360mm (complementry)

Weir with chute with ski jump

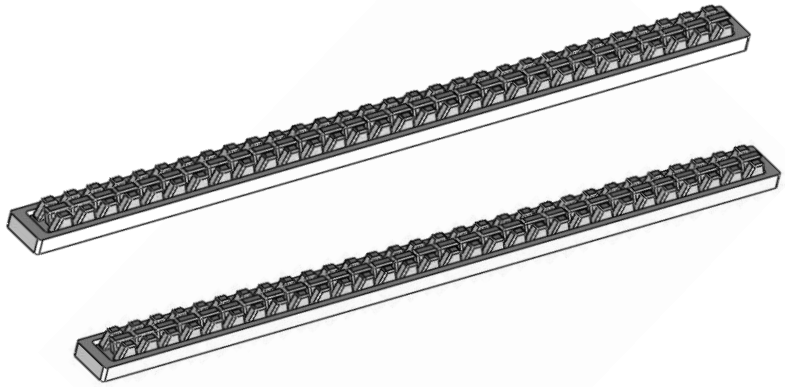
- LxWxH: 470x397x360mm (complementry)



7) Flume Bottom with Pebble Stones/Artificially roughened bed

a) flume bottom for the experimental flume
b) flume bottom with pebble stones consisting of two elements
c) Flume bottom

- 2x LxWxH:1250x390x60mm



8) Wave generator

Surface waves are produced by a paddle that moves back and forth. A motor with a frequency converter, coupled with an adjustable crank mechanism, drives the paddle. The stroke of the crank can be continuously varied to suit experimental needs. The motor is mounted on the experimental section of the flume while the paddle is anchored at the base.
The accessory is automatically recognized by the PLC system, with the paddle's frequency displayed and controlled via the touch screen interface.
Two wave absorbers minimize wave reflection at the flume's ends, effectively reducing wave heights as water passes through them. All wave experiments are conducted without the presence of flow.

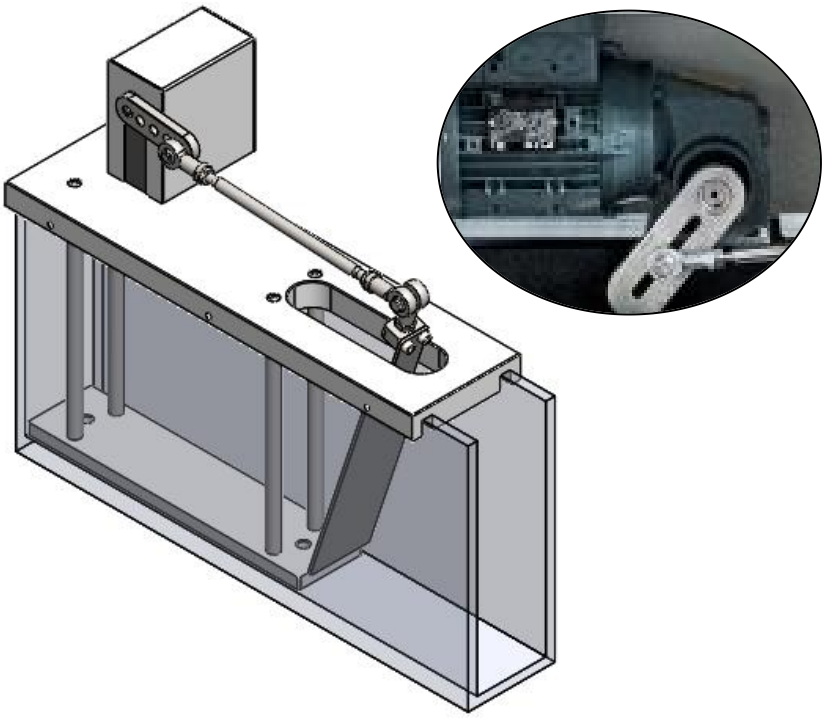
a) Motor with gearbox
   - power : 1hp
   - output speed: 0…110 rpm

b) Crank mechanism
   - stroke: 60…200mm
   - frequency: 0.18…1.83Hz

2 wave absorbers with 8 perforated plates each (**Optional**)

c) Generation of surface waves via paddle swinging back and forth
d) Drive of the paddle via crank mechanism and motor with gear
e) Motor with variable speed via frequency converter
f) Stroke of the crank mechanism manually infinitely adjustable
g) Frequency of the crank mechanism continuously adjustable via touch screen of

h) Two wave absorbers reduce the reflection of waves

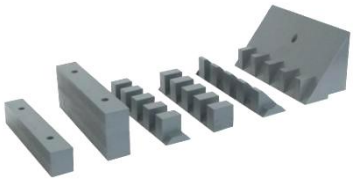


9) Elements of energy dissipation

a) Weir with chute block
   - LxWxH: 397x123x160mm Approx.

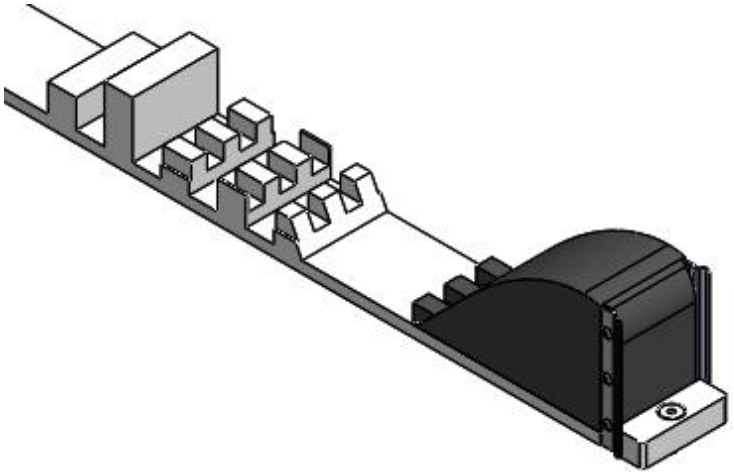
b) 2x Baffle blocks
   - Five rectangular blocks
     - LxWxH: 397x50x55mm Approx.
     - blocks WxH: 30x40mm Approx.

c) 1x Baffle blocks
   - Five triangular blocks
     - LxWxH: 397x50x55mm Approx.
     - blocks WxH: 30x40mm Approx.



d) End sill
   - LxWxH: 397x50x55mm Approx.
   - LxWxH: 397x50x110mm Approx.

e) base
   - LxWxH: 1500x397x15mm Approx.



10) Wave absorbing beach

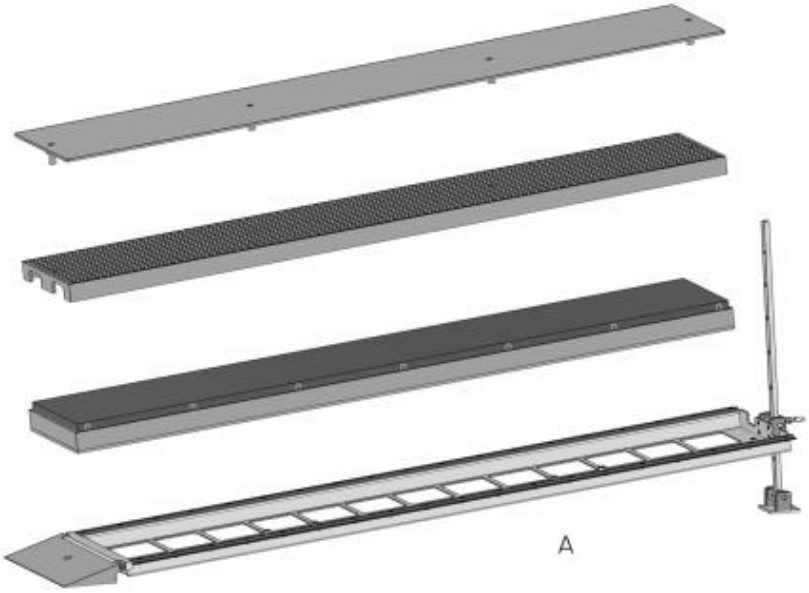
a) Beach surfaces
   - impermeable plain beach
   - impermeable rough beach
   - beach with permeable surface

b) LxWxH: 1300x395x480mm

c) Inclination of the beach: 5…40% in 5% steps

d) Wave absorption system manufactured from high quality stainless steel to minimize maintenance.

e) A beach to minimize splashing from paddle movement.



11) set of piers

Pier profiles:

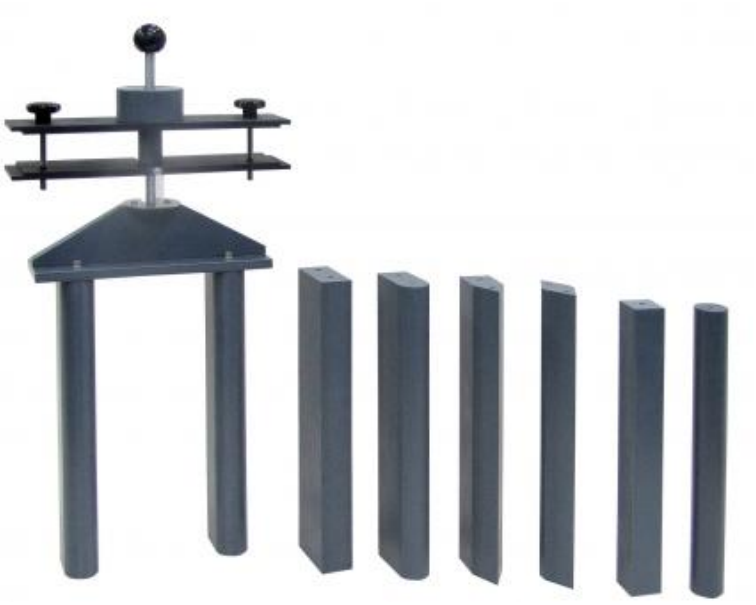
a) Rectangular

b) Circular

c) Square

d) Rounded on one end (complementry)

e) Rounded on both ends (complementry)
f) Tapering profile on one end (complementry)
g) Tapering profile on both ends (complementry)



Pier holder with clamping device for the mounting of piers into the experimental flume: up to three piers mounted at the same time on 9 different positions

pier holder with angle scale to indicate the angle of attack

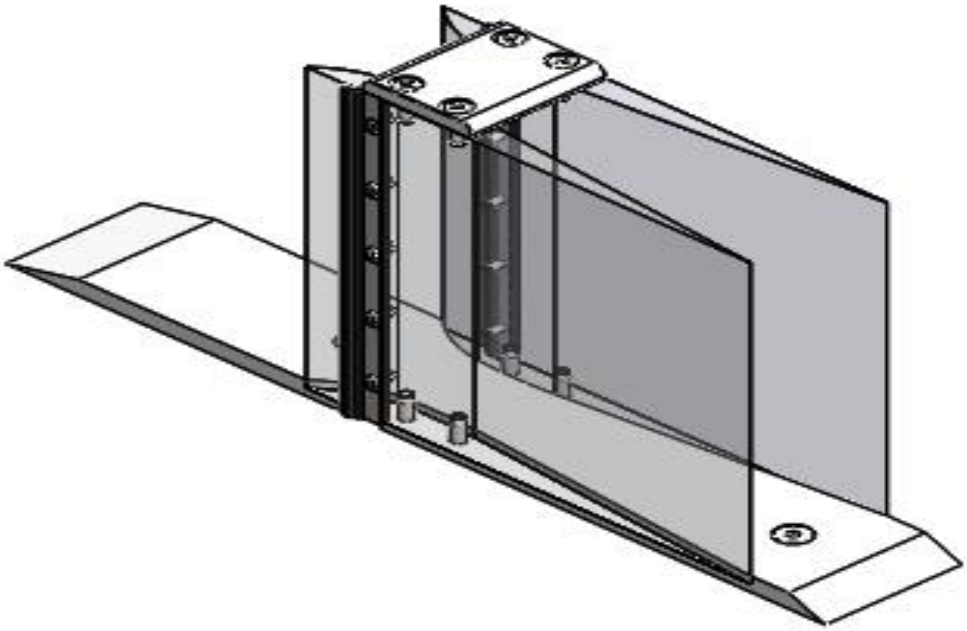
Material: Piers made of PVC

- Angle scale: ±90°
- graduation: 15°

LxWxH: 430x110x770mm

12) Venturi Flume

a. Venturi flume
    i. LxWxH: 1200x397x500mm
    ii. narrowest cross-section, WxH: 202x480mm
    iii. material: PVC
b. Side element
    i. LxWxH: 1006x101x480mm
    ii. material: PMMA



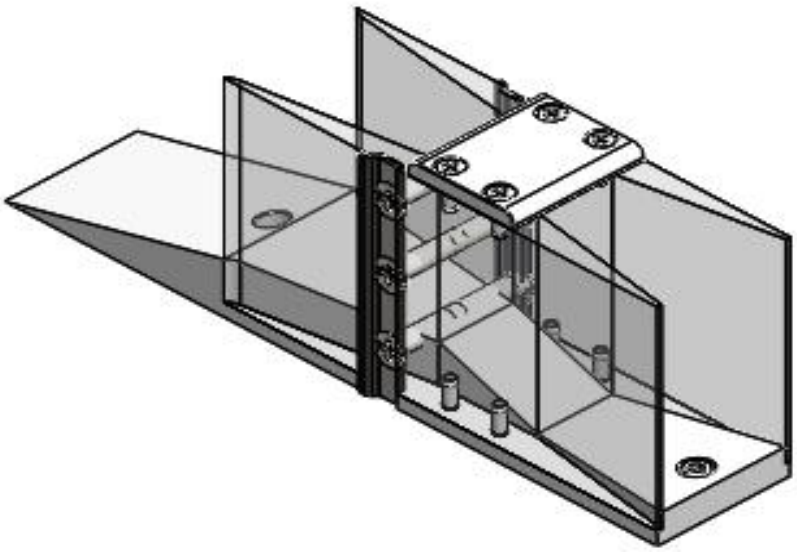
13) Partial Flume

One of the most widely used methods of measuring the flow of water in open channels.

a. Parshall flume (3”)
   i. narrowest cross-section, WxH: 76x152mm

b. Side element
   ii. LxWxH: 990x164x450mm
   iii. material: PMMA

c. Base plate
   iv. LxWxH: 1200x397x75mm
   v. material: PVC



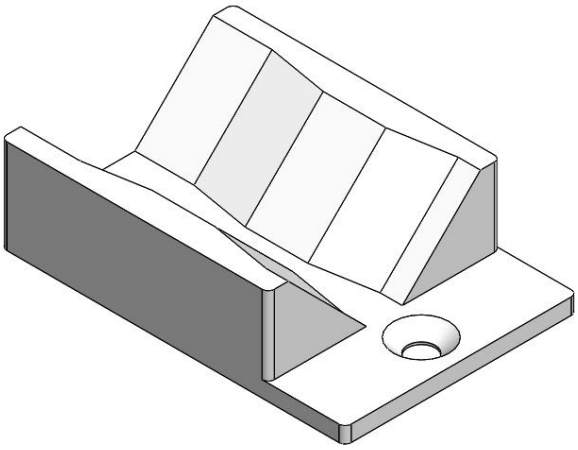
14) Trapezoidal Flume

a) Trapezoidal flume conforms more closely to natural channel sections and passes sediment even more freely than the Parshall Flume.

b) Investigate the effect of submergence on the accuracy of measurements using a WSC Flume when the flume becomes drowned

c) Trapezoidal flume

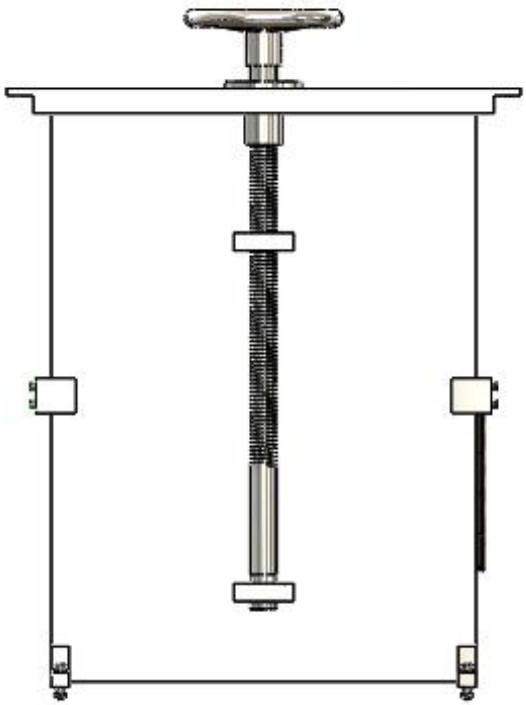
- Narrowest cross-section, WxH: 28x117mm
- Material: PMMA
- LxWxH: 500x397x175mm



15) Sluice gate

a) Sluice Gate

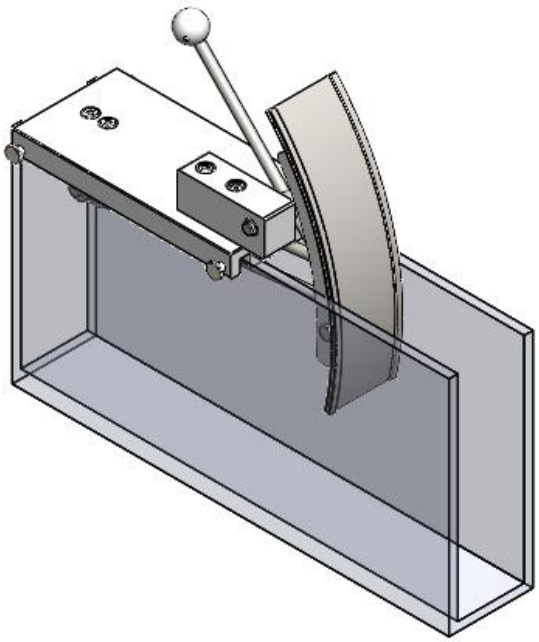
- weir plate made of PVC/Stainless Steel
- head adjustment: 0…200mm
- sluice gate with lateral sealing lips
- height adjustment using handwheel
- scale to read the height of the gate opening



16) Radial gate

a) Radial Gate

- weir plate made of stainless steel, width: 397mm
- radius of the segment: 450mm approx.
- LxWxH: 600x400x850mm



17) Rake

- Rake
  - number of removable bars: 11
  - bar inclination: 40°…90°, graduation: 5°
- Bars
  - 3 profiles: rectangular, circular, streamlined body
  - bar material: PVC

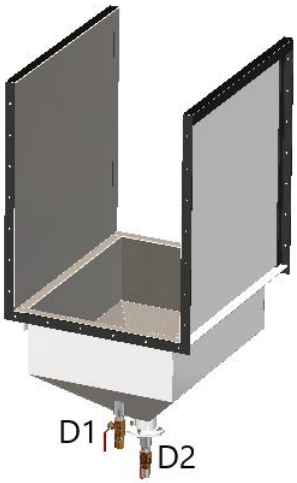
18) Instrument Carrier

- The instrument carrier able to slide on the provided track of the flume apparatus along the length
- 4 wheel is attached with the ball bearings for its smooth movement
- Brake available

19) Sediment trap section (complementry)

- Sediment trap section made from stainless steel.
- When using the sand particle in your experiment, then the sediment trap section collect the sand particle, here we have two filter installed in this section.

- One in the base of the section (D2) and other one in the mid half of the depth in the taper section (D1)
- Open the D1 to remove the excess water, if any above the sand particle
- Open the D2 to drain the seepage water that are contained by the sand particles, calculate its weight if required
- Then open the flange nut to remove the sand from the sediment trap section



20) Walkway (complementry)

- Walk way is provided to stand on it.
- Side rail is also provided for safety
- It needed to fix weir and/or accessories into the flume channel.
- Also student can observe, by standing on to the walkway.
- The stairs portion is movable, can move it to the front side as well.