U.S. ARMY | US Army Corps of Engineers | ERDC

WAVE FLUMES

The U.S. Army Engineer Research and Development Center (ERDC) Coastal and Hydraulics Laboratory (CHL) houses three state-of-the-art wave flumes that are ideally suited for addressing a wide range of applications across a broad range of geometric scales. These flumes support research and site-specific studies of both government organizations and non-government organizations, including academia and the private sector.

APPLICATIONS

All 2D flumes are for coastal applications, ranging from fundamental research of water wave propagation physics, wave interaction with natural and nature-based features, and sediment transport in wave-current environments to designing and testing military infrastructure and coastal structures to include armor stability, wave runup, reflection, transmission, and overtopping.

RECENT PROJECTS

- Measuring response of floating military causeway systems in the surf zone
- Assessing the effectiveness of of innovative proprietary wave attenuation technologies and systems
- Quantifying wave attenuation of natural and nature-based features including wetlands, mangroves, and reefs
- Dune breaching, overtopping, and erosion in the presence of vegetation
- Generalized breakwater deterioration and stability studies
- Testing of instrumentation under controlled conditions prior to field deployment

WAVE FLUME SPECIFICATIONS

	0.9-m Flume	1.5-m Flume	3.0-m Flume
Length (m)	45.7	63.0	63.0
Width (m)	0.9	1.5	3.0
Depth of test area (m)	0.9	1.5	1.5
Additional Features	glass walls along entire lengh of flume	15.2-m long, flat testing area with viewing glass following and opposing currents	15.2-m long, flat testing area with viewing glass

WAVE GENERATORS

	0.9-m Flume	1.5-m Flume	3.0-m Flume
Max Stroke (m)	2.0	2.0	
Max Paddle Velocity (m/s)	–	0.6	
Period Range (s)	0.5 - 5.0	0.5 - 5.0	
Max Regular Wave Height	0.45-m between the wave periods of 1.7 – 3.5 s[1]	0.6-m at a wave period of 2.0 s[2]	
Max Significant Wave Height	0.23-m between the peak wave periods of 1.7 – 3.5 s[1]	0.3-m at a peak wave period of 2.0 s[2]	

[1] - at a depth of 0.8-m
[2] - at a depth of 1.6-m

All wave flumes are equipped with piston-type wavemakers with modern wave generation capability, including active wave absorption. These wavemakers can create regular waves, irregular waves for commonly used (e.g., JONSWAP, TMA, Pierson-Moskowitz) and user-specified spectra, and solitary waves.

SUPPORT

An extensive variety of precise instrumentation complements the state-of-the-art capability of the flumes. The instrumentation includes capacitance wave gauges, acoustic Doppler velocimeters (ADVs), particle image velocimetry systems (PIV), underwater and surface motion tracking systems, and terrestrial LiDAR. Shop capability includes custom model bathymetry; 5-axis CNC machining for plastics, wood, and metal; 3D printing; acrylic molding; and skilled trades like carpentry, welding, and plumbing.

CONTACT

Dr. Duncan Bryant, PE
CEERD-HICERF@usace.army.mil
601-634-3898