

Fluid Dynamics Demonstrators

Educational Training Equipment for the 21st Century

Bulletin 699

H-6990

Tilting Water Channel and Gate

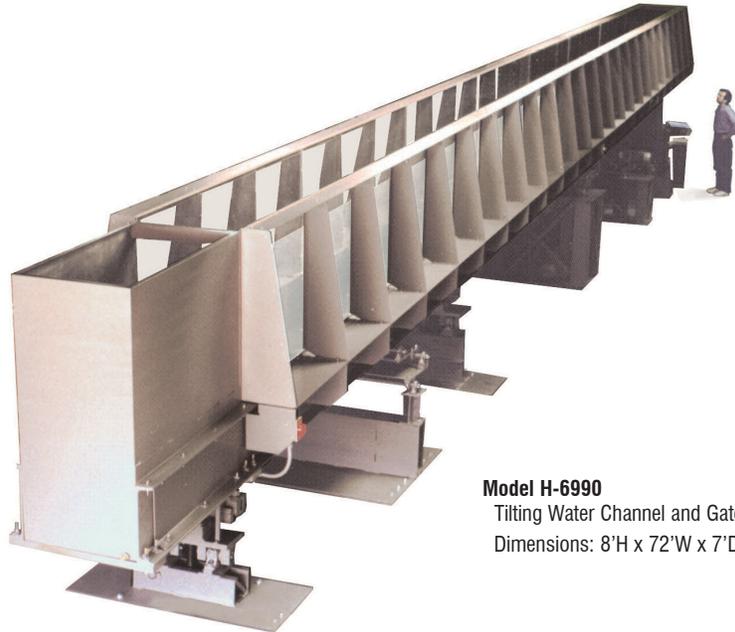
Purpose

The Hampden **Model H-6990** Tilting Water Channel and Gate System is designed for use as a general purpose center pivot flume. With it, one can demonstrate and investigate steady and unsteady flow, sediment transportation, weirs, sluice gates and wave phenomena.

The channel consists of a head tank, working section and a tail tank.

Features

- Instrument rails for instrument carriage assembly.
- The entire working section sidewalls and bed are constructed of clear acrylic sheets suitable for Laser Doppler Anemometry.
- Leveling, screws to permit accurate alignment of the channel bed.
- In the level position, the channel working bed is 37 inches (0.90M) above the floor.
- The head tank walls are flush with the channel side walls. A recess is provided to install the furnished honeycomb or metal mesh filter media in the inlet in order to develop satisfactory flow conditions without surface disturbances.
- A removable, adjustable (for height and feed rate) sediment feeder, fabricated of stainless steel, is provided. A manually operated jib crane is furnished to aid in placing the sediment feeder. The crane may also be used for installing the optional wave generator.
- An incremental tailgate set is furnished. It is designed to operate as a weir or underflow gate.
- A sediment trap, built of stainless steel, is fitted in the tailbox. The trap is installed and removed using the jib crane.
- A 6" (0.15m) return flow pipe of PVC connects the inlet and outlet tanks. It is provided with a butterfly control valve.



Model H-6990
Tilting Water Channel and Gate
Dimensions: 8'H x 72'W x 7'D,

Channel

The working length of the channel, the head tank and the tail tank are supported by a welded steel beam assembly, fabricated of standard channel sections. The floor supports are located every 16 feet (4.88M) such that the maximum beam deflection does not exceed 0.040 inches (1.0mm), when considering the beam to be uniformly loaded, (filled with water), and simply supported at the ends. The beam end flanges are mated with dowel pins and secured with bolts.

The total length of the channel is 72.0 feet (21.34M). The working section is 64.0 feet (19.5M) long. The inside channel dimensions are 23.6" W by 35.4" D (0.60M x 0.90M).

The channel is constructed of 1.0 inch thick acrylic clear sheets. The channel side walls are braced with stiffeners located every 32 inches (0.813M). The construction joints are solvent-welded and screw fastened. The working section is assembled of 96 inch long modules (2.43M). The individual sections are joined with acrylic end flanges sealed with polyurethane sealant.

The channel is fitted with an instrument carriage assembly. This consists of an aluminum frame fitted with precision linear "V"-guide bearings. The instrument carriage rides on precision, linear "V"-guide system rails which are supported by adjustable support brackets.

All Hampden units are available for operation at any voltage or frequency

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Tilting Water Channel and Gate

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Channel *(continued)*

The support rails are fitted to the top edge of the channel side wall. The instrument carriage is positioned with a DC motor. The aluminum carriage is anodized. The rail is marked with a continuous scale calibrated in SI units. The overall length is 60.0 feet (18.3M) with a 4.0 foot (1.2M) section left clear at the upstream end of the channel to permit mounting of the sediment feeder.

The head tank and tail tank are constructed out of stainless steel sheet and angle. Construction joints are TIG welded and polished. All fasteners are stainless steel.

The slope of the channel bed sets with a system of jacking stations and a center pivot assembly. The slope is variable from 0.0° to +3.0°. Pairs of heavy duty worm gear drives, coupled to a motor are used to elevate the channel. The monitors are controlled by variable frequency drives (or inverters), which in turn are controlled by a microprocessor located in the control console. Varying pitch/gear ratio combinations keep the jack stations in phase. The jack station is controllable from a control console. Limit switches are also supplied to prevent over-travel in both the elevation and depression of the channel. Palm type, emergency stop pushbuttons are furnished at each jack station, (three on one side, two on the other). The control circuit devices operate on 24VAC to ensure the safety of personnel using the channel.

The channel supports include pairs of leveling screws to permit fine adjustment of the channel bed level at final assembly.

Instrumentation

An instrument carriage is included with the channel. The instrument carriage is provided to run on the rails fitted to the channel walls.

It is powered by electricity and its position controlled from a remote console. The carriage carries an instrument holder which is mounted and driven in such a way that an instrument head can be placed by remote control at any point within the working length of the channel. The carriage is also designed to carry equipment up to a total weight of 250 kg and is provided with electric cables giving 10 pairs of signal wires permanently connecting the instruments mounted on the carriage with the control console area.

Limit switches are provided at the end of travel on all traversing systems. Position signals must be generated by tach-generators or gear motors fitted to all traversing systems. The carriage operation is compatible with auto control through a microcomputer (IBM PC or similar).

A variable inclination sluice gate, fabricated of acrylic and fitted with a lead screw angle adjuster, is furnished as a part of the channel system. It is removable and may be installed in any of the 8 channel sections.

A digital meter is provided to display the slope of the channel bed to a resolution of $\pm 0.1\%$.

Services Required

Electrical:

120V.AC-1 ϕ -60Hz
120/208V AC-3 ϕ , 5 wire

Water & Drain:

Customer to provide adequate water source and drain.

Optional Equipment

H-6990-P

Pump Assembly

H-6990-WG

Wave Generator

H-6990-V

Venturi Assembly

H-6990-PCV

Pneumatic Control Butterfly Valve Assembly

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