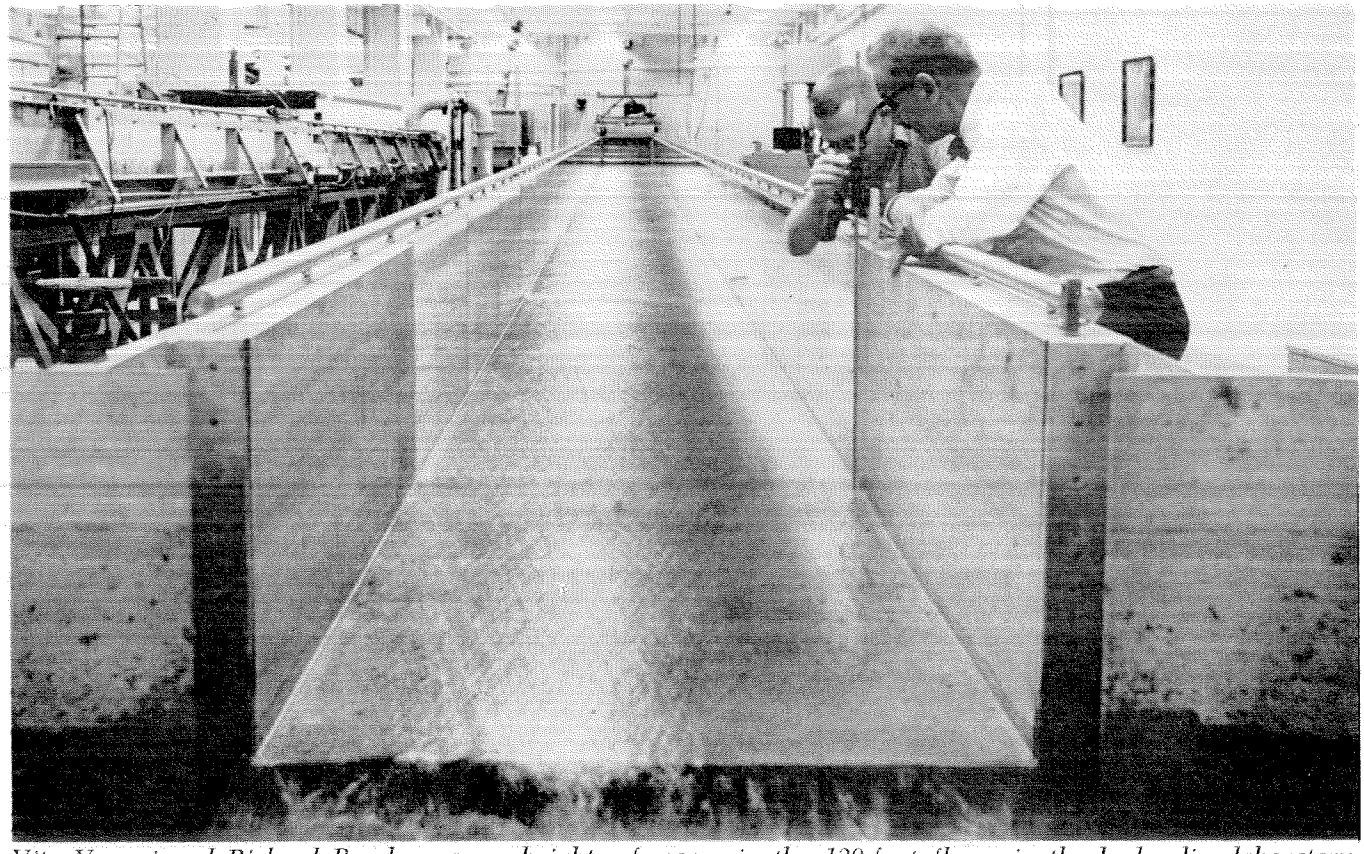

Vito Vanoni and Richard Brock measure heights of waves in the 130-foot flume in the hydraulics laboratory.

Simulated Waves and Flood Control

Using a 130-foot-long flume, Caltech engineers are simulating waves that develop in Los Angeles County's flood control channels during light and moderate rain, to determine whether the waves will build up to dangerous heights during the infrequent periods of concentrated, heavy rainfall. Many of the new concrete channels have never been tested in such rain, and if the waves are present, flooding could result, even though the channels have been designed to accommodate the amount of water being fed into them.

The research, being conducted by Vito A. Vanoni, professor of hydraulics, and graduate student Richard Brock, is sponsored by the Los Angeles County Flood Control District, which operates the world's most extensive metropolitan flood control system. It includes 14 major dams, 12 debris dams, 51 debris basins, over 500 miles of open concrete flood control channels, and 642 miles of enclosed storm drains.

Waves are manufactured in the flume, and the engineers observe how they propagate and what shapes they take, and measure their velocities and heights. There are no detailed field data available on these factors.

The waves have been observed when the channels are carrying from only a few inches to about two feet of water. The problem is to determine what kinds of waves there will be, if any, when the flood channels are at capacity. The channel walls are designed to be about 2½ feet higher than the high water mark during maximum flow.

Apparently the waves require some time and distance to form. They first appear a mile or more below the channel inlet in a small flow of water traveling at about seven miles an hour. The waves always travel faster than the water. The greater the volume of water in a channel, the faster the water will move. When channels are running at capacity, the water in them may be traveling as fast as 40 miles an hour. This velocity may not give the waves enough time to form. One of the goals of the study is to learn whether time or channel length is more important.

The channels are designed to move water more rapidly than did the original stream beds which they have replaced. The beds had many boulders and turns which slowed the flow. The channels are designed to move as much water as possible in the shortest time. The resulting rapid flow means that more water can be handled in a smaller channel.