Flume Demo Intro

SPEAKER Bob Holmes: Hello. Welcome to this part of the course. We will use a miniature flume to demonstrate various concepts of the course. We can do this because we can vary--with this flume, we can vary the slope, we can vary the flow of the water, we can vary its depth. Now what we have behind me here is a miniature plexiglass flume that measures 4 inches by 6 inches for its cross-section, and then we have it is about 8 feet long. So what you see behind me is you have both the downstream end and the upstream end. We'll have water flowing through it. Now, let's look a little bit closer at the upstream end.

As you'll see here, we have a diffuser which has a lot of little holes drilled in it as it comes up to the flume. And at the bottom there with the blue is a handle or a valve that we can adjust to adjust the flow rate. You'll also see some black blocks that we'll use to alter the slope of the channel bed that will enable us to induce various hydraulic flow structures. If we look at the downstream end, we can go over here and we can see that we've got a trash can. We have--again we have some more black blocks and we have a trash can that will serve as our reservoir that holds the pump as the water flows into the reservoir, it will essentially be pumped back around into the upstream end in the diffuser and come back into the flume.

Now, let's go back up to the upstream end and we'll turn the water on. Okay. As you see, we've got the water coming here and we will start to adjust the valve to show you that we can reduce the flow rate. So you can see that we can put the flow down fairly small. Now as we pan down the entire part of the flow here, you can see that the depth of this flow is very small. It'd be very hard to demonstrate many things to you. So what we'll do as we get down to the far end, we will put in a tailgate to force an artificial backwater condition that will allow us to raise the depth. So as that tailgate comes into play, we can then see that now we're inducing a backwater condition and we'll be able to have a much deeper fold that we can actually look at some of the flow hydraulics. So as we pan back upstream and look, you can see that the flow velocities are--especially away from the tailgate, they get—the depth is much deeper and the velocities are fairly uniformed from from the bottom of the channel to the water surface itself.

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Now, we want to make sure that we stay away from the diffuser because you can see all kinds of crazy hydraulic vortices and things like that as that water is coming into the flume.

So what are we gonna do with this? We're gonna use various scaled hydraulic structures and we're gonna fit those in the flume to demonstrate the various flow concepts that we talked about in each one of the lectures. So, for example, an ogee spillway is something's that's very common. And what you're gonna see here is as we insert that, you'll see that we have various hydraulics that we can induce here and we're gonna pull the tailgate out and we see that that drops the water surface down here at the far end. And as we look back up here and get a close-up shot of this ogee spillway, you can see that the water is very tranquil on the upstream side of the ogee. And as it comes across the precipice there on top of the ogee, we get into a much more rapid flow, the velocity picks up, the depth decreases, and so then you see it going on downstream.

Now, let's go to another type of structure. We'll pull that ogee out and we're going to put in a culvert. Now, every small road in the country has got culverts on it. And so what we've got here is we've got a plexiglass tube that simulates what a culvert would be. Again, the white Styrofoam would simulate the roadway and we've got the flow as it comes from upstream to downstream, you can see what kind of impact that culvert has on the flow structure.

Now, this is very important. Not only would we use this, the concepts that we gain in basic hydraulics, to design what size of culvert we'd need, but for those of us in the full measurement gain, sometimes we can't get out there for every event to measure the peak flow and so we can use the high watermarks that the flow leaves behind to give us an idea of what the flow is through that culvert at the peak.

Now, I could show you many, many more different types of control structures that we'll put into the flume and I'm not gonna do that because we're gonna do that in subsequent lessons as we go into other lectures.