Aquadam Stability Calculation Whitchurch engineering job no. HCS1901

Little Webberville Boat Ramp Renovations Date October 29 2019

The water elevation and river bottom elevations used in this calculation are taken from the drawings be I.T.Gonlzalez Engineers for the Littel Webberville Boat Ramp Renovations, dated 9-12-2017. This calculation assumes the deepest elevation in the river in the area the dam is installed is elevation 367.5' The drawings show the water surface elevation as 370.39'. This calculation is for a retained water depth of 3'. The water flow was measured on October 23rd 2019, by HCS General Contractors, by timing the flow over a 50' distance for an average of 29 seconds. The flow velocity used in this calculation is 1.7 feet per second. We have been instructed, by HCS GEneral Contractors, that the river bottom is sandy gravel. The Aquadam is not expected to sink in this material. The coefficient of friction for geotextile fabric against sands and gravels, from a study by Bosto Geosynthetics, is .84. .5 is the coefficient of friction used in this calculation.

Whitchurch Engineering assumes no liablility for material or workmanship failures, nor for improper dam installation, nor for conditions varying from those stated above.

Single dam

Dam height, h	5	feet	1.52	Meters
height of retained water, d	3	feet	0.91	Meters
Temp of water in dam and being retained assumed similar	68	deg F	20	deg C
Density of water, g	62.4	lbs/cuft	999.6	Kg/cuMeter
flow rate normal to dam, v	1.7	feet/second	0.52	Meters/Second
Coeficient of friction, m	0.5		0.5	
Contact area-width across bottom of dam, w	11	sqft/ft	3.3528	sqmeters/meter
Lateral force from flow = dgv^2/(2*Gc)	8	lbs/ft dam length	122.7	N/M dam length
Lateral force from static height = gd^2/2	281	lbs/ft dam length	4,099	N/M dam length
Total lateral force	289	lbs/ft dam length	4,222	N/M dam length

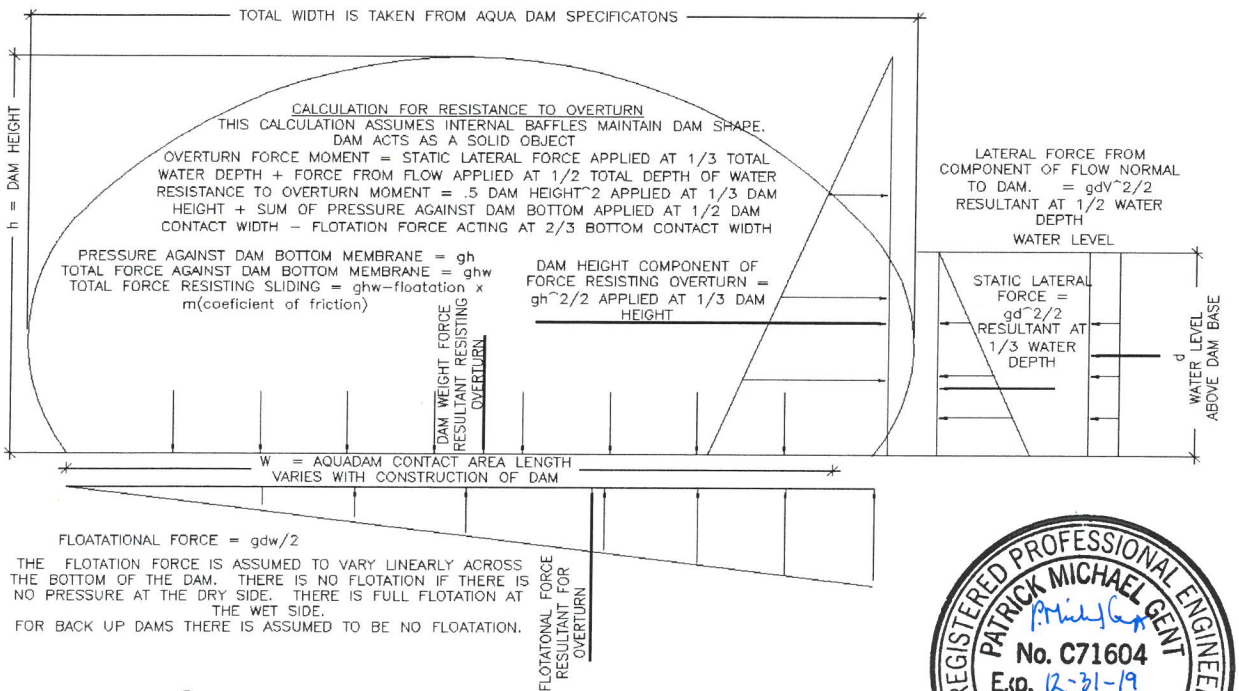
Resistance to sliding

Total pressure acting on interior dam membrane contact width, = ghw	3,432	lbs/ft dam length	50,103	N/M dam length
Flotation force from static height = gdw/2	1,030	lbs/ft dam length	15,031	N/M dam length
Net gravitational force creating friction = ghw – gdw/2	2,402	lbs/ft dam length	35,072	N/M dam length
Frictional force resisting lateral movement = m (ghw-gdw/2)	1,201	lbs/ft dam length	17,536.22	N/M dam length
Factor of safety against lateral displacement = lat. force/frict. force	4.15		4.15	

Resistance to overturn

Moment imparted by static depth = .3333*d*gd^2/2	281	ftlbs/ft dam length	1,249	NM/M dam length
Moment imparted by flow = .5*d*dgv^2/2	13	ftlbs/ft dam length	56	NM/M dam length
Moment imparted by flotation = .6666*w*gdw/2	7,550	ftlbs/ft dam length	33,597	NM/M dam length
Sum of overturn moments	7,843	ftlbs/ft dam length	34,903	NM/M dam length
Resisting vertical moment dam width water weight = .5w*ghw	18,876	ftlbs/ft dam length	83,994	NM/M dam length
Factor of safety against overturn = resisting moment/overturn moment	2.41		2.41	

THE LENGTH OF EACH DAM SHOULD BE ESTIMATED FROM THE TOP OF THE STARTING BANK, DOWN TO THE TOE OF THE SLOPE, ACROSS THE CHANNEL, AND UP THE OPPOSING SLOPE. THIS SHOULD BE ESTIMATED ALONG THE OUTER EDGE OF EACH AQUADAM. ADD 5FT EXTRA AT EACH END THAT IS AT THE TOP OF THE BANK.



CHECKED BY : BRETT WHITCHURCH

REGISTERED PROFESSIONAL ENGINEER
PATRICK MICHAEL GENT
No. C71604
Exp. 12-31-19
Oct 29 2019
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STATE OF CALIFORNIA