

INVESTIGATION OF THE IMPACT OF EARTHQUAKE NOVEBER OF 2017 SARPOL-E ZAHAB ON THE HIRVI REGULATORY DAM USING INSTRUMENTATION DATA

Mohsen KHADEMI

*M.Sc., Ferdowsi University, Mashhad, Iran
mzmkhademi@gmail.com*

Hassanali SERAJ

*B.Sc., Amirkabir University, Tehran, Iran
info@serajabzar.com*

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In this paper, the effect of the impact of Sarpol-e Zahab earthquake on Hirvi regulatory dam by 3D mechanical jointmeter data and combined chart has been investigated. In concrete dam 3D mechanical jointmeter use for measurement of displacement that occurred between tow block (Hezarkhani et al., 2010). The earthquake, with 7.3 magnitudes, occurred on 12/11/2017. In this research, the data of installed instruments such as 3D mechanical jointmeter have been used and it is shown that the earthquake caused rotation and settlement of the dam body blocks and opening of the joints of the blocks.

Hirvi dam located in Paveh county-Kermanshah province-Iran and is a regulatory dam that built on the Sirvan River. Hirvi dam contain 22 block that 11 block located on right bank and 11 block on left bank (view is downstream to upper stream). 3D (X, Y and Z) mechanical joint meter installed on joints of between blocks. X axis dimension is horizontal and parallel to dam axis, Y axis dimension is horizontal and is perpendicular to dam axis and Z axis is vertical and is perpendicular to dam axis. X axis shown the opening, Y axis shown the shearing and Z axis shown.

According to 3D mechanical jointmeter data, in the period of the earthquake of Sarpol-e Zahab, we can diagnostic that block R7 relative to R6 and block R6 relative to R5 enclosure. From block R4 to block R1 this process conversely and block R2 relative to R3 and block R1 relative to R2 enclosure (Table 1).

Largest opening occurred between joint of block and R4/R3 and toward right and left opening is less (Table 1).

Table 1. Displacement of X and Z axis of 3D mechanical joint meter.

JOINT	X axis (Opening) (mm)			Z axis (Settlement) (mm)		
	2017/11/13	2017/11/11	DIFF. (mm)	2017/11/13	2017/11/11	DIFF. (mm)
R8-R7	-0.03	0	-0.03	0.05	0.03	-0.02
R7-R6	0.6	0.23	0.37	0.17	0.06	-0.11
R6-R5	-0.04	-0.09	0.05	0.13	0.05	-0.08
R5-R4	0.68	0.08	0.6	0.09	0.04	-0.05
R4-R3	1.17	0.46	0.71	-0.01	-0.05	-0.04
R3-R2	0.62	0.18	0.44	-0.14	-0.07	0.07
R2-R1	0.14	0.08	0.06	-0.36	-0.26	0.1
R1-M0	0.6	0.35	0.25	-0.41	-0.27	0.14

To achieve a better view, we created combined chart that shown all X and Z axis of 3D mechanical jointmeter data on longitudinal section of dam body (view is downstream to upper stream) (Figure 1). This chart calculate displacement that happened between tow date (set by user and in this paper set date of before and after of the earthquake of Sarpol-e Zahab time). In this period, water level of reservoir was stable then we could tell that all displacement was related to the earthquake of Sarpol-e Zahab.

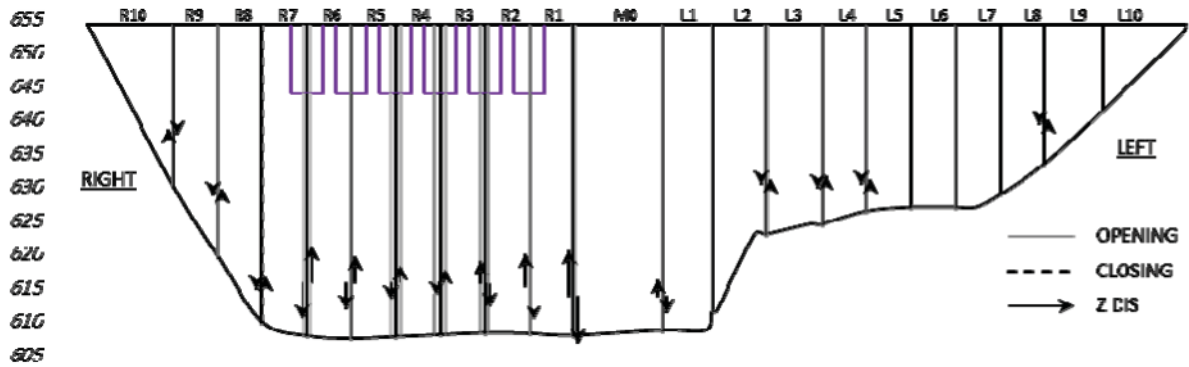


Figure 1. X and Z axis on longitudinal section of dam body (view is downstream to upper stream).

According to this model (Figure 2), blocks of R7 to R4 rotated in clockwise direction with vertical axis and blocks of R4 to R1 rotated in anticlockwise direction with vertical axis. Largest opening occurred between block R4-R3 and R4-R5. This model is probably due to the R4 block settlement. The settlement of this block leads to the rotation of neighbouring blocks. The right blocks rotated in the direction of the clockwise and the left blocks are rotated in the direction of the anticlockwise.

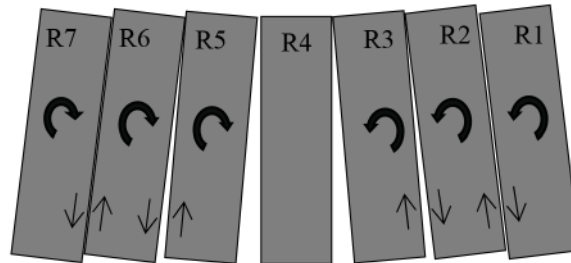


Figure 2. Model of clockwise and anticlockwise rotation in block R1 to R7.

REFERENCES

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