Seismic responses of high-rise intake towers considering multiple-support excitation effects

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The seismic safety and proper functioning of intake towers in a major earthquake are very crucial to the whole hydraulic project, since the controlled release of the reservoir could help to prevent catastrophic failure of a dam after an earthquake by reducing the water pressure. The dynamic response of high-rise intake towers during earthquakes may present quite complex characteristics due to many factors. The complexity of the analysis is increased by important soil-structure interaction effects. A free-standing intake tower usually exhibits an access bridge that connects the top of the tower to the dam or abutment. Therefore, the intake-outlet tower and bridge system has two well-separated supports. Different local soil conditions, traveling wave effects, phase difference in the seismic motions, and other factors can cause a spatial variability of the ground motion at the supports. These multiple-support excitation effects can be important in the calculation of the seismic response of the system. Therefore, and because of the lack of previous investigations dealing with these effects, this paper is aimed to study in more detail their influence on the dynamic response of the high-rise intake tower. The multiple-support ground motion excitation method will be proposed. The dynamic interaction between the tower and the access bridge will be investigated.