Influence of the concrete strength parameters uncertainties on the seismic response of concrete gravity dams

G. Sevieri* and A. De Falco†

* Department of Civil and Industrial Engineering (DICI)
University of Pisa
Largo Lucio Lazzarino 1, 56122 Pisa, Italy
e-mail: giacomo.sevieri@unifi.it

† Department of Energy, Systems, Territory and Constructions Engineering (DESTEC)
University of Pisa
Largo Lucio Lazzarino 1, 56122 Pisa, Italy
e-mail: a.defalco@ing.unipi.it

ABSTRACT

Concrete gravity dams are among the most important infrastructures of a country because of their use for flood control, energy production and agricultural industry supply. Therefore, the preservation of concrete dams against seismic events is an important task for our society, especially because the largest part of them have been designed by following only static concepts [1]. In this context, numerical analyses of the seismic behaviour of concrete dams are useful tools both to control the structural health state and to predict their remaining life expectancy. However, the study of the seismic behaviour of concrete dams is an open issue for civil engineers due to the absence of case histories and the large amount of uncertainties involved in their numerical analyses [2]. In particular, once a deterministic model is set up the main sources of uncertainty are those related to the mechanical parameters of the materials [3].

In this paper, the effects of the concrete strength parameters uncertainties on the seismic response of dams are investigated. In particular, the general Polynomial Chaos Expansion (gPCE) is used to propagate the uncertainties through the deterministic model [4]. Different Quantities of Interest (QI), commonly used in dam engineering field, are considered, e.g. displacements, velocities, accelerations, damage propagation. The aim of the paper is to numerically investigate the effect of uncertainties which strongly influence the estimation of the seismic behaviour of the dam, in order to provide practical indications on Uncertainty Quantification in dam engineering field.

REFERENCES