SUSPENSION ASEISMIC CONSTRUCTION WITH ELASTIC TIE-RODS

ID 056

Federico BARTOLOZZI

Civil Engineer & Independent Researcher
Via dei Carracci 4, Varese, ITALY
ciuciuzza@iol.it

ABSTRACT

The aseismic system, concerning the proposed suspension construction, has the following characteristics:

- absence of direct contact of the construction with the soil (suspension construction);
- transfer of the load to the soil by means of elastic steel tie-rods.

The inertial force in the construction due to an earthquake undulatory shock is directly proportional to the construction displacement variation and inversely proportional to the length of the tie-rods.

It has a zero value when the first parameter has zero value or when the second parameter has infinity value. The displacement variation is never equal to zero if the soil displacement and the construction displacement are in phase; vice versa it is equal to zero in phase opposition only with reference to the design seismic frequency equal to $\varphi_p = 1{,}41\ \varphi_{o,n}$, where $\varphi_{o,n}$ is the construction horizontal natural frequency.

The design seismic frequency is selected only on the basis of statistical data concerning the design area. In order to safeguard the construction against the resonance danger, which occurs when the seismic frequency equalizes the construction natural frequency, it is necessary to determine an interval of - undulatory and sub-undulatory - seismic frequencies, where the frequencies, including the resonance one, are not compatible with the construction safety.

Therefore, with respect to this emergency interval it is essential that suitable devices – that is horizontal dampers and vertical frequency converters – spontaneously start in order to decrease the construction displacemts to values not greater than prearranged admissible displacements of design. In addition, the numerical analysis points out that the inertial force in the suspension construction with tie-rods is on average 4% of the corresponding inertial force in the same construction without tie-rods.

This considerable decrease of earthquake energy in the construction gives to the proposed system a remarkable economical competitiveness with respect to other existing aseismic systems.

Key words: .