ABSTRACT

The effects of acoustic contamination on population is currently increasing, being the means of motion one of the main responsible. At present the railway is a mean of motion that can introduce to the city a lot of people (suburban trains, regional and big lines) and is used, still with a percentage low, to carry any merchandise. However, future predictions says that the percentage of merchandise carried by railway will increase because railway has a social and environmental cost smaller than highway, which begins to be saturated. For these reason, it is essential to take action in order to control and to reduce environmental noise.

Noise is defined as an undesired sound. The annoyance caused by it depends on different factors like frequency, rhythm and the exposure time. To assess correctly the noise levels it is necessary to find an indicator which relates the sound emitted to the annoyance created. $L_{Aeq}$ is the noise indicator most adapted because, unlike the others, it considers all the group of sounds that people must suffer during a period of time and, at the same time, evaluates the noise level and the exposure time.

In the year 2002, the Parliament of Catalonia adopted the law 16/2002 of Protection against acoustic contamination. The immission limits for noise exposure caused by means of motion were set in 68 dBA as maximum level during the daytime and 63 dBA at night in moderate sensitive areas. Since most of the railway lines belong to these areas, this paper only focuses on moderate areas.

To make an acoustic control of Catalan railway network it is necessary to define the acoustic typology of all the trains and to identify acoustically all the railways based on the parameters which define the emission and the propagation of railway traffic noise. It is also need establish the distances from which the territory reaches the quality objectives set by the law 16/2002. The acoustic quality distance becomes the control parameter. The method used in this paper is the Guide du Bruit made by C.E.T.U.R., although it is not recomended by the recent adopted European Directive. The Directive recomends the national method of calculation of Holland, but this is too complex and it is not adaptable to the Catalan orography.

The method of C.E.T.U.R. is based on the caracteristics of trains (reference sonorous level: $L_0$; length: l; velocity: v) and railway lines (trains intensity, trains types and velocity). The acoustic quality distance due to both the pass of a single train and the whole traffic of trains is calculated by the method of C.E.T.U.R. These distances are compared to the edification limit (50 m) that railway law 1211/1990 fixes to know the railway lines acoustic situation.

According to the obtained results, several control points of the railway network are proposed to check theoretical with experimental data. 64 control points which belong to 64 different acoustic sections of the Catalan railway network are established. Therefore a characterization of the Catalan railway network is obtained at the same time.

Finally an acoustic evaluation of each control point of the railway network is carried out and the IGAX ratio is used to get the global acoustic evaluation of the Catalan railway network. This is useful to assess easily the network and to understand better its acoustic situation. A periodic update of this method permits us to know the railway network’s situation throughout the time and to follow the acoustic evolution of railway lines to plan future interventions.