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## ACOUSTIC STRATEGIES OF BARCELONA. SOUND CULTURE FOR THE 2004

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**ABSTRACT**

The acoustic rehabilitation of any city bears with some secondary effects that might alter it. In a touristic city, the anti-noise management should especially protect those places that are interesting from a touristic standpoint. The acoustic strategies for Barcelona that are being studied now, are based on its urban and building morphology. The different authorities working on it must propose for the next 2004 a Sound Culture. This project should highlight the intrinsic qualities of the urban structure of the city, I'm referring to those qualities that have been adopted as a model of urban rehabilitation by other cities.

**1 - INTRODUCTION**

Barcelona, capital of Catalonia, has actually 1.600.000 citizens, but it is surrounded by different cities and towns configuring an effective metropolitan area with 3.000.000 citizens approximately.

Its situation in the north-east of the Iberian Peninsula provides a high relation with Europe. Its situation at 41° latitude north like Rome, puts Barcelona 3 degrees highly than Athens. Also, the climatic environment of Barcelona, as similar as all mediterranean Europe, conducts to a kind of activities based in the touch with the nature and architectures with doors and windows opened in most seasons of the year.

This fact produces people living on the street, and this produces that they want to joy the outdoors sites of the city.

**2 - BCN PRE 92**

First, we have made punctual actions instead of design a real environmental policy of noise controller.

First of all, the urbanism of Macià Plan conceived by GATCPAC and Le Corbusier for Barcelona could not be initiated because the beginning of the spanish Civil War in 1936.

When the war was over in 1939, and after the first postwar years, appears the Region Plan of Barcelona, that include the city and the districts around in 20 km.

During the year 1957 and 1974, the period known as "Porcioles's Barcelona" has the maximum levels of urban density, specially in the "Eixample" of Cerdà sector.

In fact, we must say about the "Eixample" that in the beginning the solution of Cerdà consistent in square blocks of houses of 110 m. as results to impose an structure of main streets and secondaries streets (20 m) appears a very important space. It's a central public garden surrounded in two or three sides by housings. This garden, even known as "block garden", has forgotten in each ordinance made after that design.

Thus, between 1860 and 1890 was valid the "plots ordinance", which allowed edificate the 50% of each plot till reaching 20 m of elevation.

Afterwards, came the "block ordinance" during the period between 1891 and 1941, which allowed to build the 73% of each block with a depth of 28m and to occupy the garden building till 4,4m.

After that, appears the worst mistake of Barcelona urbanism. This mistake was the "congestive ordinance" of 1942 till 1976, which allowed thicken Barcelona till its maximum rates, allowing to build in the "Eixample" till 24,4 m (for that cause appears the ground floor and seven more floors, with two top

floor over 45 degrees), and allowing to increase the height edification of the garden till 5,5m, and it can be increased using ziggurat forms.

After the dark period of postwar urbanism, in 1974 appears the Metropolitan Corporation of Barcelona, which includes Barcelona and 24 municipalities. Before being dissolved in 1985, it drove the creation of General Metropolitan Plan of 1976.

At that moment, "Eixample" recovers part of his first spirit in the less space even not built, where the ordinance of GMP allows till 20,75m, and 4,5 height in the inner garden.

The first municipal activity to control noisy activities for reducing noisy protests of the citizens is to make an ordinance about noises and vibrations. Thus, the article 289 of the Urban Rules of Metropolitan General Ground Plan 1976 concrete 3 dB of noise as maximum allowed in the municipalities of the Metropolitan area.

Till 1979 the city begins to understand his really meaning and it becomes a great urban laboratory where, with more or less success, the examples have been done as a surgery "in situ" with special studies for each case.

In 1981 appeared the Basic Norm of Acoustics Building Conditions, the first state norm which forces the isolation of all kind of buildings.

With the last revisions this norm is called NBE-CA/88, and I was participate in the 1990 Catalanian Architects College program.

As an important objective, the NBE-CA/88 explains the need of knowing the sonic city maps.

The urban inspection service of Barcelona Council developed in 1983 a municipal ordinance of noise control and vibrations with excessive night requirements, because puts the top allowed at 25 dB in the bedrooms of housings, which is required only in several countries of European Union.

We want rehabilitate the diagram of Cerdà Plan about "Eixample" area.

The central "Eixample" occupies an area of 880 Ha, that suppose 550 blocks, with 125 streets, that mix the residential uses with tertiary uses with a population of 300.000 citizens (1/5 of Bcn population), where also are 300.000 workers, and where pass through 600.000 cars daily.

To make possible what Cerdà designed in the beginning, in 1986 was created the "Rehabilitation Ordinance" of this "Eixample", where is not allowed to build in the inner garden, where is obligatory to seed trees and to make a garden –public at the beginning- with 3.000 m<sup>2</sup> in each block.

Barcelona publishes its sonic map in 1990. In this document appeared the "black points" of the city, where the 75 dBA are surpassed.

It's important to say that the values of the map are lower than the values of the map are lower than the European Agency of Environment values, based in partial studies of a conflictive "eixample" of the city. Now we have some examples like "the gardens of water tower", where has been rehabilitated the inner garden of one island of "Eixample", having at 13:45 h. A indoor Leq1 level lower in 25 dBA respect 76 dBA measured on the street (even with the presence in that garden of ventilators and mechanical elements).

At urban level, the arrival to the sea of the city has been beginning with the transformation of the railroad sectors and industries of the littoral. It's important to emphasize the recuperation of the port and dock used now for pastime activities, and the creation of the "Ronda litoral" which closes the circulatory ring with the new "Ronda de Dalt".

But specially, the Olympic games of 1992, impulsed the "Villa Olimpica". The transformation of this part of the "Eixample", in the point of view of its tipology and use, has permitted the study of new acoustics variables.

### 3 - BCN POST 92

As Federation of municipalities says, most of the citizens protests are about night clubs and discotheques, because these locals open at silence hours, but there are many other activities – traffic is the first- which surpass the international rules.

Spain and Japan are, as World Organization of Health says, the two countries with the highly acoustic contamination, where the traffic is the main cause, even at this time when the cars and trucks make less noise than few years ago.

In Barcelona, traffic makes the 85% of the infractions, most important than music at excessive volume or alarms.

A study of 1993, in this case of the European Agency of Environment, puts Barcelona as the second city most noisy of the continent, with 40% of its population usually exposed to more than 40 dB (the 1988 sonic map says that 47% of the inner part surpass 65 dB). However, as OCDE says, this situation was

common in all spanish municipalities with more than 20.000 citizens: 57% of housings have excessive noise at diurnal schedule.

### **3.1 - Urban proceedings**

First of all, it's necessary that we have to dismiss that Barcelona is one of most noisier cities of the mediterranean. On the street level maybe is true, and actually treatments are made, like reconducting the heavy traffic, closing streets to traffic, etc. But we do not have to forget that 1/3 of population live beside the inner gardens where the noise levels are augmented by them and by mechanical elements, more than traffic noise.

### **3.2 - Building proceedings**

At the same time, we have to recover the "galeria" (balcony at the back of houses). This is a closed by glass space, that in most cases works as a greenhouse, that divides the inside and the outside. It's a space between the street and the bedroom, or between the inner garden and the pieces of housing, workings as a acoustic insulating space as a "pillow", because, in general, it does not need silence and it does not make noise.

Other cities are famous because they have balconies, like balconies of A Coruña. This balconies have been also chased and protected by different ordinances, but many architects would use them because the balconies have environmental thermic and acoustic qualities if this spaces were protected.

Also, it can be driven normatively the use of more absorbing materials and forms more dispersive of the sounds by the new buildings.

### **3.3 - Street proceeding example**

People that goes to the parks and public spaces wants an environment more comfortable than the street. One good decision was to cover the main streets semiburied. The designers of these ways thought right that with this method noises shall be lower. The real problem is that cars drive more fast and the wrongs finished protecting walls make more noise direct to the housings.

People have protested constantly and this situation now still in several sectors. People that could not finish themselves the problem have associated and finally have been adviced by professionals.

Then, they have understood that it could be profitable economically building a parking over that road, because the financing came by selling the seats to the neighbors.

Therefore, where have been noise Leq1 levels of 76 dBA, now only have 64 dBA, produced by local traffic and works sounds, with a backgrounds variability of 70 dBA for the non covered case till 57 dBA for the covered case.

But what is more interesting is that in the housings were more noise than the noise measured on the street. In fact, the pedestrian situated over the protecting walls is exposed to a Leq1 level of 82 dBA. This means that the reduction of noise during the day is arround 18 dBA.

Now the people of this emplacement are very happy, because the noise problem is resolved and for the same price they have a space to walk by and have relation with the neighboring.

### **3.4 - Parks proceeding examples**

Another problem was how to make the treatment of public spaces that have been recaptured for the city. In fact, these spaces are mostly little, and very dispersed in very distant places in the city. They are obeying to the spirit of "oxygenation" impulsed by the architect Oriol Bohigas for having in each sector a place for citizen relationship.

The problem is remove these spaces far of the noise of streets. In many cases this aim could not be reached, but in other cases they tried to use soft methods with a "dune" and vegetation, or hard methods.

In any case, the examples done show that this spaces are very well received by the adults, because in several cases we can reach decreases of 13 dBA of Leq1. But who likes more this measures are the children, because incentive many games based on the force of gravity.

## **4 - BCN VERSUS 2004**

Now, surpassed most problems inherits of the past, Barcelona wants to be a "Sustained City" also in the environmental meaning. This is one of the challenges to the Universal Forum of Cultures in 2004, with three main areas: city, environment and creativity.

The own sounds and noises made for our technology seems to be a very important part.

In order to reach the definitive arrival to the sea of Barcelona, old industrial sectors of the periphery will be transformed. This is the case of "Diagonal mar", a south sector of one of the biggest arteries of the Cerdà Plan, where two thousand new dwellings will be built.

Barcelona has finished the actualization of the 1990 map. This map of the 1998 has been presented to the city council, and this is the reason that is not of the public property yet. As a conclusion we can

see that the city has improved its sonorous climate according to the action of the interurban ways of the "Ronda del Mig" and the "Ronda de Dalt".

The black points of the "Eixample" have decreased.

The problem could appear with the beginning of the new State Norm, called as "Ley del silencio" (silence law). This law will force to create special acoustic protection zones "ZEPA'S" in the towns. In order to the magnitude and the interest of the property business in the city, this kind of designs can foment new controversies between population and the administration.

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