

## **WHEN WILL THE ISOLATION PROGRAM IN AMSTERDAM END?**

A J Huijbregts

OMEGAM, Amsterdam, The Netherlands

### **1. INTRODUCTION**

In the Dutch noise abatement law is regulated industrial noise, road traffic noise and rail traffic noise. Aviation noise is regulated in a separate law. These laws are based on 2 principles ie:

- to prevent new bad noise situations
- to repair the wors old noise situations

For the existing houses the maximum permissible noise level is stated in the laws and when this level is exceeded the gouvernement has to take measures to solve the noise problem. In practice the government gives the municipalities money to make plans and (when they agree with these plans) also the money to execute the plans. The part of the law for the existing situations is implementated in 1986 for road traffic and in 1987 for rail traffic. For the reservation of the account of money that is needed for this operation there were made only raw estimations. Because of financial problems the original idea, that the noise problem could be solved within 10/15 years, was abandoned. At the same time the traffic situation was dramatically changed because the road traffic increased in number and size and therefore more and more houses had to be isolated. In 1994 the situation was so confused that there was no insight in the amount of houses still to be isolated in the next years. Therefore the government asked all municipalities to make within half a year a list of all the houses with noise levels exceeding 65 dB(A) for road and rail traffic noise in respectively 1986 and 1987. Because the minister will base his isolation program on this list, the list must be hard. Houses not mentioned on the lists cannot be isolated. So the lists must be made very, very carefully.

### **2. PURPOSE OF THE INVESTIGATION**

The goal of the total operation was to make a juridical defensible list of all the houses that still must be isolated.

Because this is a enormous job the work is splitted in two lists of noise levels:

- exceeding  $Leq = 70 \text{ dB(A)}$ , the so called "A"list
- lying between  $65 \text{ dB(A)} < Leq < 70 \text{ dB(A)}$ , the "B"list.

In the noise abatement act is stated that when measures must be taken for existing houses, this must be done in view of future situation. To reduce the noise level of existing houses several measures can be taken, for exemple:

- to reduce the number of traffic
- to change the road surface by using more quiet asphalt
- to place barriers between the road and the houses
- to isolate the houses

The environmental consequences of these measures are different. Therefore source measures are preferable to barriers and facade isolating. So first you have to take traffic measures than road surface measures followed by barriers and house isolation. Because the financial system of all these measures is different, our list must contain only houses that must be isolated. This means when other measures are possible the concerning houses must excluded from this list.

Decisive to be placed on the list is the situation of 1986 ie 1987.

But for the measures (and therefore the price) the future situation has to be considered. Therefore the list must contain the situation of 1986 (1987) and 2010.

A complicating factor is that the "A"list must contain not only the houses with  $Leq > 70 \text{ dB(A)}$  but also the houses in the side streets connected with the houses in the main streets till  $Leq = 65 \text{ dB(A)}$ .

Because already quite a lot of houses are isolated, the final list must be updated with these houses. For an similar reason the list must be updated too with the new houses built after 1982. In accordance with the law these houses must be provided with the adequate acoustical measures.

As one can see there were quite a lot conditions to be fulfilled to make the definitive list.

### 3.SOLUTION

Some years ago we had already made an road traffic noise map of Amsterdam. This map was based on a traffic model of Amsterdam made by a special department of the municipality.

In this model the streets are represented by lines and the crossings by nodal points. Furthermore the model consists in schemes of traffic that going from one point in the system to an other point (arrival - depart matrix). And when each line in the system (street) is given a certain friction factor, you can make a calculation of the traffic intensities.

When the model and the traffic matrix is correct, it must be possible by adjusting the friction factors to get an good agreement between the results of the model and the reality. Because the public buses and trams follow a defined route, we have superposed the number of these vehicles to that of the usual traffic.

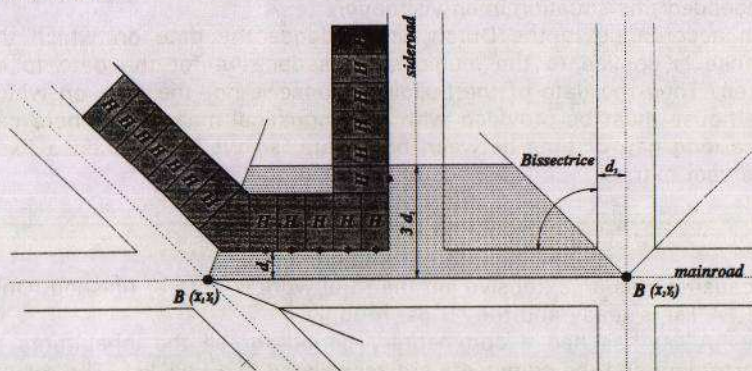
Then to each line of this network we have coupled the formulae calculating the total sound level of the traffic on the facades of the houses. Because it is impossible to vary the parameters of one line between two crossings, we have adjusted only for acoustical reasons extra crossings when the differences of the distance traffic-facade differs too much. At this moment the model consists of 2000 lines which all represent the main streets of Amsterdam. So with this model we are able to calculate the traffic-noise level at the facades of the houses in the streets of our model. Based on this model the road-traffic situation of 1986 is first reconstructed. This situation was based on the data of the traffic countings of the last years. This work was followed by prediction of the future situation of 2010 based on all traffic plans which are reasonably sure at this moment.

In the calculations of the road traffic noise the other acoustical parameters of road surface and sound barriers are taken in account..

In Amsterdam there is an house databank in which are gathered:

- the **addresses** (street, number, floor)
- the **coordinates** of all the buildings
- the **function** of all the buildings
- the **date** of the building licence

Then we have coupled the two systems and we have selected the coordinates of all the houses within a certain distance ( $3 \times$  distance between facade and traffic line) of the traffic line in accordance to the next picture.



This distance is chosen on practical experience and depends on the mean breadth of the side streets.

Unfortunately it was not possible in the short time we had, to extend our sound calculating model with the sound damping of the side streets so we have done this by hand. The damping of sound in the side streets is calculated with a practical formula based on an earlier investigation. For the rail traffic noise we have used the same method to tackle the job.



#### 4. PROBLEMS

In the work we have done we found the following problems:

- On the bases of traffic data, my office made traffic-sound calculations for building isolation for nearly 20 years. So we have collected in these time quite a lot of traffic data. These data are based on the available traffic countings and are specially made for the case in question. Comparing these data with those of the model, we unfortunately have found many differences between both figures. Because it did take quite a lot of work (and time) to get reasonable data, we have learned from this proces that it is impossible to get accurate predictions for each street.

- A large number of houses (13,000 houses don't have coordinates). Fortunately most of these houses were new. The other we have given new coordinates.

- In Holland there is no fixed definition of a house.

So we have made our own definition, stating that a house must have a surface of 24 m<sup>2</sup>, an own front door, kitchen, toilet and bathroom. This means that most of the student houses, homes for aged people etc are no houses in this sentence.

- In Amsterdam the function of a building is not always quite clear. So there are buildings used as houses when the rents of houses are better than offices and vice versa. In accordance to the law the use of the building is decisive. Therefore we have visited all these buildings and embedded this situation in an visitpaper.

- In accordance to the Dutch jurisprudence the date on which the license is applied to the municipality is decisive for the date to be taken. Thus the date of the building licence is not the date on which the house must be provided with the acoustical measures. There can be a long gap of time between both data, so we have taken a fixed one year extra.

#### 5. RESULTS

Because it was an extensive job the total work is not yet finished. Only the "A"list is ready and the "B"list roughly.

The "A"list has had a commentary period for all the inhabitants of Amsterdam and the comments are assimilated in a final list. The results in Amsterdam are as follows:

- nearly 20 kilometers of barriers were placed
- nearly 19,500 houses were already isolated
- on the "A"list 18,067 houses still remain from which 5,325 are situated in the side streets
- on the "B"list are approximately 60,000 houses.

So an enormous job is still to do.