inter.noise 2000
The 29th International Congress and Exhibition on Noise Control Engineering
27-30 August 2000, Nice, FRANCE

I-INCE Classification: 1.3

SYSTEM ENGINEERING METHOD FOR ROAD TRAFFIC NOISE CONTROL IN CITY

W. Ren

Beijing Municipal Institute of Labour Protection, No.55 Taoranting St. Beijing, China, 100054, China, China

Tel.: 10-63524202 / Fax: 10-63522307 / Email: bmilpo@public.bta.net.cn

Keywords:
ROAD NOISE, VEHICLES NOISE, NOISE LIMITS, CONTROL METHOD

ABSTRACT
A system engineering method based noise propagation aspects, including noise emission, noise transmission path and noise immission of road traffic noise, is proposed in this paper. The main factors in the system engineering method include noise emission limits of vehicles (acceleration emission limits for new vehicles and stationary noise emission limits for used vehicles), noise prediction and assessment for new road system and residential area, novel measures for reduction of noise immission on building facades. The paper also presents developmental trend of the technology of the method, and introduces effect, assessment and practice for the factors in the method.

1 - INTRODUCTION

Road traffic noise emitted from different kind vehicles is main noise pollution in the world, especially for rapid expanding cities and dense high-rise cities. In order to obtain good efficiency and economy in the road noise control and taking account of complication of the road traffic control, a system engineering method is proposed. The main factors in the system engineering method include noise emission limits of vehicles (acceleration emission limits for new vehicles and stationary noise emission limits for used vehicles), noise prediction and assessment for new road system and residential area, novel measures for reduction of noise immission on building facades, reasonable plan and design for urban area, regulation and administration.

2 - MAIN REGULATION FOR ROAD TRAFFIC NOISE CONTROL

The main regulation and standard relating road traffic noise control are noise emission limits for accelerating road vehicles, noise emission limits for stationary road vehicles, noise immission limits for boundary line of main road, noise emission administration for vehicles horn and technical specification of muffler and other noise control elements. The regulation and standard system is shown in Fig 1. The regulation and standard system have been practice in some cites in China and got some effect in traffic noise control.

In order to let the system bring into play much effect there are the following problems we have to research and solve.

(1) Relativity of measuring results between accelerating and stationary method is just good for heaven vehicles and not for light vehicles [1]. Noise emission regulation for new vehicles by accelerating method in most countries has a good practice effect, but there are short of the practice measures for used vehicles by stationary method. In fact the controlling noise emission from used vehicles is a key point for road traffic noise control in some countries special in developing country.

(2) The measurement results, including accelerating and stationary method, are only noise emission in specifically operation condition. It's necessary to look for a measurement method, which can express vehicles noise emission in real road driven condition. Many vehicles manufacturers have pied more and more attention on noise reduction for vehicles in the specifically operation condition, but noise reduction effect for noise emission in real road driven condition and road traffic noise may be unconscious.

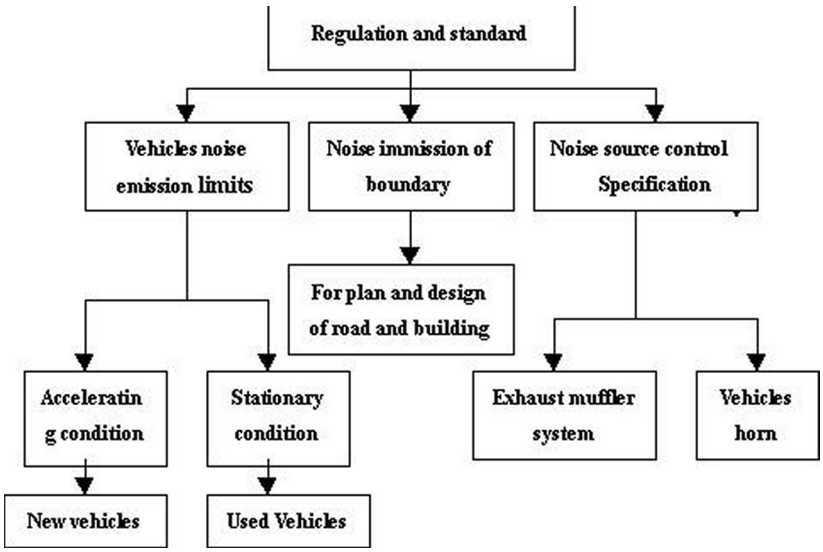

Figure 1: Regulation and standard system for road traffic noise.

3 - PREDICTION AND ASSESSMENT OF ROAD TRAFFIC NOISE

Prediction, assessment and reasonable layout are key points in road traffic noise control for new road system and new buildings around the road used. The program is shown in Fig. 2.

There are some problems in the program practice. Most plan and design experts pay more attention on road and building function than noise pollution control. It leads to more and more resident apartment faced to main road with heave motorcar flow.

Noise control measures are an important part of prediction and assessment for a project. It's very necessary to set up a special institution to supervise the measures practice and monitor effect of the measures.

The reasonable layout, traffic flow control, prediction, assessment and monitoring for noise are interdependent factors in system engineering. It is a pity that the interrelation affairs are responsible by varies department and institution and there is not an authoritative department to manage the system.

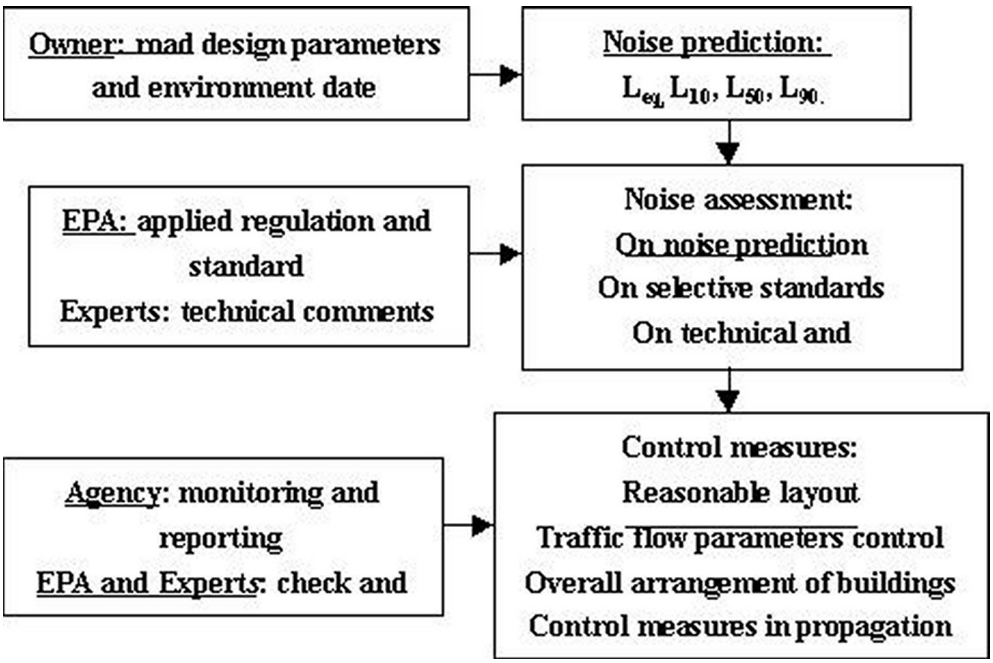

Figure 2: Program of assessment for road traffic noise.

4 - CONTROL MEASURES IN PROPAGATION AND BUILDINGS

Noise control measures are sometimes very difficult after road layout and traffic flow statuses are fixed on. The road barrier, insulation windows and other insulation measures in buildings may be accepted.
(1) Road barrier
There are about 20 road barriers constructed in China in past 5 years. Most of them are located in city road system and a few located in suburb freeway. The main parameters about the barriers are shown in table 1. A design guide for road barriers as standard document has been prepared and it may provide a means for feasible and reasonable design and assessment of barriers.
(2) Insulation windows
Windows facing street for frontage building are main noise transmission paths and adopting isolation windows has been a main measure for noise pollution control in frontage building. Insulation index of different kind of windows and improve measures are show in Table 2.

Insertion loss, dBA	height, m	type	main materials
5∼10	2.5∼4	absorptive barriers: 90% reflective barriers: 10%	metal perforated fibres; porous concrete and cement; transparent plastic element with and without perforated

Table 1: Parameters of barriers.

Type of window	Insulation Index, dB	window configuration
Mono-layer-ordinary window	15∼18	window frame: plastic-steel glass thickness: 3∼4 mm
Improve for frame and seal	+2	increasing thickness of frame material improving seal performance
Increasing thickness of glass	+(3∼4)	glass thickness: 5∼6mm
Composite glass	+(7∼ 10)	5mm glass+10mm air space+5mm glass
Double-layer insulation window	+(10∼15)	5mm glass+100mm air space+5mm glass
Air space with absorptive material	+(2∼3)	thickness of absorptive material: 5mm

Table 2: Insulation index of different kind of windows and improve measures.

(3) Insulation corridor and balcony
Adopting proper sound treatment in for rooms faced road also can get some noise reduction. Insertion loss of the noise control measures is show in Table 3. The insertion loss is measured at center of room with corridor or balcony and faced road.

Sound treatment	Improving height and air proof of corridor breast wall	Absorption treatment for ceiling of corridor	Common balcony	Acoustical balcony
Insertion loss dBA	2∼3	1∼2	5∼8	10∼13

Table 3: Insertion loss of corridor and balcony.

REFERENCES

1. **Ren Wentang**, Investigation in the interrelation between stationary noise emission and running emission from road vehicles, In *Inter-Noise 96*, 1996

2. **Ren Wentang**, Criteria and control for environmental noise and emitted from motor vehicles, In *16th ICA and 135th Meeting Acoustical Society of America*, 1998