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STUDY REGARDING THE VIBRATION TRANSMISSION OF THE AUTOVEHICLE ABOUT HUMAN BODY

Aurora Felicia CRISTEA, Acxel Emil FARCAŞ, Mariana ARGHIR

Abstract: The paper presents an experimental study regarding the transmissibility vibration about human body. These experimental studies include the vibrations measurements in the auto, after three axes. The paper presents only transmissibility after Oz_h axis, the principal axis of the anatomical coordinate system. Also, the measurements were made effectuate passing of the good and bad roads.

Key words: posterior and lumbar vibration measurements.

1. INTRODUCTION

1.1. Generality

Mechanical vibration, from the medical point of view [8], transmitted the human body have a complex action with effects of physiological nature, mechanics and heat, leading to functional and physiological changes in the body such as those listed below:
• Stimulate the nervous system and hormonal activity that may cause modification of metabolic processes (for certain types of vibration may occur changes in respiration heart activity, of peripheral circulation);

• emergence of tactile sensitivity disorders;

• emergence of fatigue and sleepiness, manifested by decreasing attention and visual acuity, which leads to reduced work capacity;

• the emergence of emotional states of fear and anxiety, functional disorders of the upper and lower limbs without being dangerous in terms of health, but that prevents the execution of commands, accuracy.

Subjective responses of the body to the request by vibration (perception, sensation of unease, fear and pain), depend on the parameters of vibration (displacement, velocity, acceleration, frequency), the duration of exposure to vibration and how to transmit the vibrations.

The action of mechanical vibration on the human body usually has as a result a deterioration of the health status of the individual exposed to them. It leads to the emergence of occupational diseases liable due to prolonged exposure to vibration. For this reason, the people that he works at a place of employment with prolonged exposure to mechanical vibrations; it is paramount to ensure its protection against vibration.

For these reasons the individual's health and safety at work [6], [7] are considered modern concepts representing product of individual and group relationships of attitudes, skills and behaviors and that determines hiring, style and effectiveness of programs for safety and health at work.

To be able to distinguish the type of vibration on the human body was needed in a classification of vibration: vibration which acting on the whole body (WBV - Whole Body Vibration);

- local vibration (segmental), in this category belong to the parents, and the vibrations the vibrations whose action is usually manifested through disorders due to Raynaud's syndrome and called Vibration White Finger – VWF (White

Finger Disease). From the same category of local vibration (e.g. cap) belongs to evil movement due to exposure to vibration.

It should be noted that local vibrations and the effects of vibrations on the whole body is not very well specify. Both types of exposure to vibrations result, in their transmission over the whole body.

2. VIBRATION MEASUREMENTS

SVAN 958 device (Fig.1) is a digital analyzer, which measures and analyzes the sounds and vibrations within 0.5 Hz-20 kHz (four-channel).

This device is ideal for measurement of vibration on the human body, being in line with ISO 361/1, 2, 5, and 5349/1, 2. Vibration measurements shall be carried out with the triaxiali transmitters. Each of the four channels can work with independent input settings, simultaneously (e.g.: type converters, filters, and constants detector time r.m.s.). The four channels allow simultaneous measurements in parallel, each having set a transducer, a filter time constants detector r.m.s. measurements can be made Device in real time, in the frequency band of an octave and the frequency of one-third of octave, depending on how the chosen setting. The precision of the apparatus is in accordance with ISO 8041/2005 (with the accelerometer to 39/L SV-0.5-3 kHz) and (with the accelerometer SV 3023 MV-2-10 kHz).

Fig. 1 Measurement equipment, „SVAN 958".

2.1. Vibration measurements of the human posterior

It effectuated measurements of the vibration, it is putting the transducer on the auto chair, under posterior. It made two types of measurements, one of the good road and the second of the bad road (Fig.2).

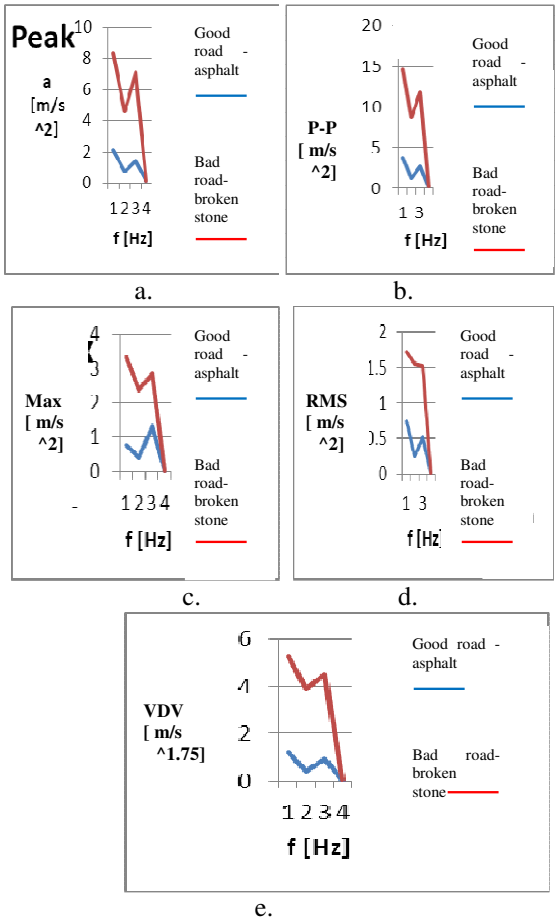


Fig. 2 Posterior acceleration measurements

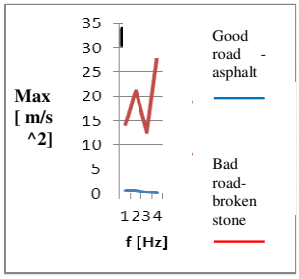
The following graphicals represents RMS (root mean square – m/s^2), P (peak – m/s^2), P-P (peak to peak – m/s^2), VDV (Vibration dose values – $m/^{s1.75}$) accelerations measures.

Also, the figure 2 represents a comparison between vibration transmited of the asphalt and broken stone roads, with transducer montated of the posterior subject, in the auto. All obtained measurements show us, that the vibration measurements of the bad road are the bigger in comparison whith obtained values of the good road.

2.2. Vibration measurements of the lumbar zone

The second mesearements vibration type was effectuated of the lumbar zone, in the auto, too. The auto was goind of the asphalt road, on the ground road and broke stone road. All results presented in the folowing figures, show us that on the bad road – blue colour (ground and broke stone) the vibration are trasmitted of the lombat zone more strongly in comparison with the acceleration of the good road – red color.

In the other case, the vibration of the ground are more strongly like a vibration transmitted of the broken stone road.



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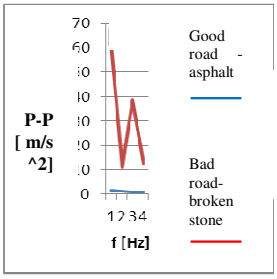

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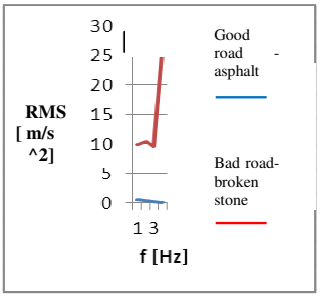

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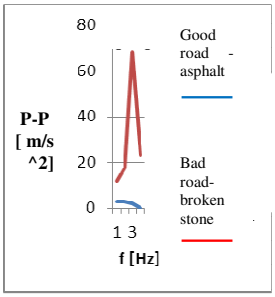

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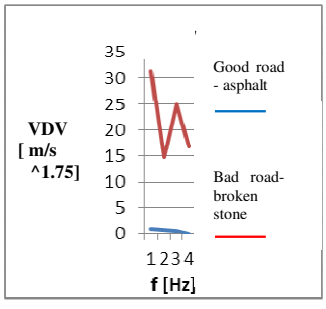

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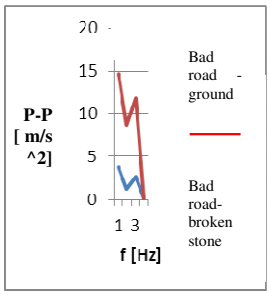
Fig. 3 Lumbar (column) acceleration measurements, with SVAN equipment.



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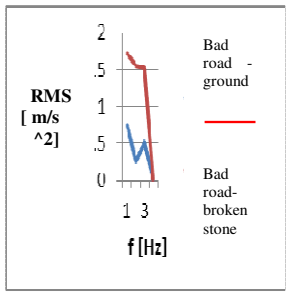

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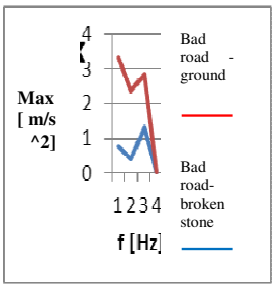

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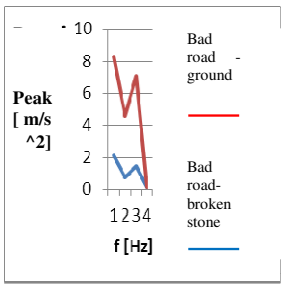

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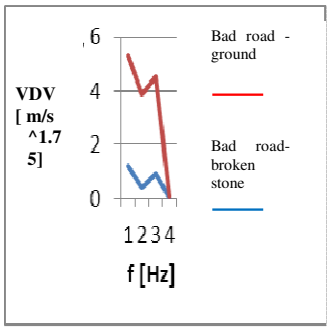

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Fig. 4 Average acceleration values measurements in comparison on the bad roads (broken stone and ground).

The figure 4 shows it that the smaller values for acceleration are obtained in the ground with pits, in comparison with broken stone road.

3. CONCLUSIONS

Analyzing the figures 2, 3, and 4 it can be said that:

- on the good road (asphalt) the accelerations are much smaller compared to those submitted by the road (ground and broken stone). In average referring of VDV these are three times the bigger of the un-asphalted road (ground or broken stone);
- It appears that bad on the road, the order of growth of the order of size of accelerations is from stone and the largest on ground with pits;

- It appears that the posterior values even the good and the bad road, are smaller compared to those submitted to the lumbar (column) of the 5 times, it probably regards depreciation of both the car seat and from the point of view of the muscular layer with compared to the back (column).

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Studiul privind transmiterea vibraţiilor dintrun autovehicul asupra organismului uman

Rezumat: Studiul lucrării prezintă o metoda experimentală în ceea ce priveşte transmisibilitatea vibraţiilor asupra organismului uman. Aceste vibraţii sunt măsurate intr-un autoturism cu transmitere la organismul uman, pe trei axe, dar lucrarea prezintă transmisibilitatea numai după axa Oz_h, axa principală a sistemului de coordonate anatomice. De asemenea, măsurătorile au fost făcute la rularea vehiculului pe şosele bune (asfaltate) şi neasfaltate.

CRISTEA Aurora-Felicia, Lector PhD. Dipl. Eng., Technical University of Cluj-Napoca, Mechanical Engineering System Department, no.103-105 B-dul Muncii, Cluj-Napoca, ROMANIA, e-mail: cristea_fa@yahoo.de.

FARCAS Acxel Emil, PhD Student Eng., Technical University of Cluj-Napoca, Mechanical Engineering System Department e-mail axel.farcas@yahoo.com .

ARGHIR Mariana, Emeritus Prof. Dr. Eng., Technical University of Cluj-Napoca, Mechanical Engineering System Department, no.103-105 B-dul Muncii, Cluj-Napoca, ROMANIA, e-mail: marianaarghir@yahoo.com .