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THE SIMULATION CONTACTS BETWEEN A VEHICLE AND A PARAPET USING AN ANSYS CODE

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ABSTRACT

The models simulation using the finite elements method conducts to results very laborious or difficult for application by other methods. The paper presents few conclusions about shocks analysis on parapets witch are necessary for different categories of ruttier roads, especially shocks between a vehicle model and one parapet from metallic or composite material with well defined physic and mechanic characteristics. In this paper the contact/impact between two bodies is accentuate by simulations using the ANSYS cod.

1. INTRODUCTION

The mathematical models, which description diverse physical phenomenon, have a form of equations or differential equations systems, with the partial derivate, the integral or integral-differential equations. The concrete problems conduct to the must of determination particular solutions which verify certain the initial conditions and to limit give so that to assure the existence and the oneness search solution. The integration problems to limit through analytic method are applicable at simple problems; at complex problems are imposed numeric analyses. The mathematical model which characterize the phenomenon studies is discredited, in the place the exact solution is determined the parameters model in certain preset points. The contact problem among two elastic bodies is an investigatory domain very important. Pursuant, the paper realizes a synthesis looking the theoretical concept, the techniques and used method in the solution of elastic contact problems.

For to maintainer and to improver the safety of the ruttier circulation, the projection of a road requires on certain sectors and in certain places the installation of device which to prevent the vehicles and pedestrians let us penetrates into the dangerous zones [1]. The devices of protection for roads can be classification thus:

1. The devices of protection for the vehicles: parapet for safety -mounted on road shoulder or on the median band of the road; attenuators for shock-device for the absorption of energy, it is install a front of a rigid obstacle for to decrease the severity of the shock; extremities/fillet corner; parapet for safety from art-works.
2. Device for protection for pedestrians: barriers for pedestrians; the pedestrians parapet

The parapet for protection is use to stop the vehicles, to get back the vehicles on the road-way and to assure the directional of the pedestrians and other the former users of the roads.

Attenuators of shock are projection to reduce the impact of the vehicle with a resistant object. Considering of the different levels for performance is establishing differently class for performance of attenuators for shock. The factors whence must take in consideration are: the type or the category roads, the emplacement them and their geometric characteristics, as and the existence of the structures with risk or zones situate

around, whence can be dangerous [3]. The severity impact suffered from the vehicles which comes in collision with an attenuator of shock is measuring with next indicators:

- Impact speed of theoretical head THIV.
- The deceleration post-impacts of head PHD.
- The index for severity of the accelerations ASI

The speed notion of theoretical head, THIV, was entered for can estimate the severity of the impact about the passengers from the vehicles where are collision with the protection device. The passenger is considering such as an object which moves free (head). The size of impact speed from theoretical head is considering to be a measure of severity shocks between the vehicle and the protection device. The head is presupposing that remains in contact which the surface in the remainder periods for impact. In this porpoise is register same levels of acceleration as and the vehicle in period the over contact (PHD) [1].

For the measure, the vehicle need to equip which two accelerometers and with an angular speed transducer (sensor of speed). It must as three sensors let us mount on a common block and it locates in a point almost the gravity centre of the vehicles. It exists and an another possibility: if is installed a complete set for transducer from to registered 6 degree of freedom from the move of the vehicle, it can calculated the complete field for acceleration of the vehicle and then, the index of severity ASI can be easy estimate in all points [1].

It must make and photographic registrations with assistance the cinematograph camera of big speed and/or video camera of big speed, they are installation so that let us delivers a completely registration of behavior the vehicle and of the parapet, inclusively the deformation [2].

The one presented previously, the severity impact suffered from the vehicle which comes in collision with a parapet, and implicit with passenger, is measuring with indicators. The measure this indicators is complicated for this motive in presence papers was simulated, use the cod ANSYS, the contact/impact between the vehicle and parapet.

2. THE SIMULATION USE THE ANSYS COD

The experimental study of a model is named and simulation and is favorite in the situations in which the study on analytic path is impossible or too laborious. The model studies is named model of simulation and is, in most happy case, a mathematical model. Simulation offers always the possibility for the study of the model, when the analytic study is not applicable.

The utilization a computer with most diverse domains for activity let us else to be a mode, it is practical necessary. From the first phases of conception and pending the final execution of a certain product, the computer replaced the classic tools, lays to disposition efficient and elegance method for thing. Is can affirm as the enormous steps out of the humanity went through it for the past decades are owed in the one eldest part use of the computer in activities economic- social.

FEM is an efficient method; from this reason the numerical simulation tends to replace the experiment from most as the simple cases to the simulation of the complex attempts. It is an approximate method and, at large, the accuracy solutions advance with the number of element used-up. The number of element with is necessary for a correct model depends for the problem and the specific result that want them. Thus, in the reason of analyzed the accuracy results for an alone run of finite elements method, it needs to advanced the number of element for an object or a zone of object and let us seen the modification of result. FEM is a very versatile method and therewith strong and can be

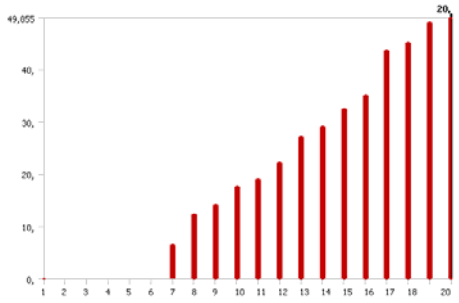
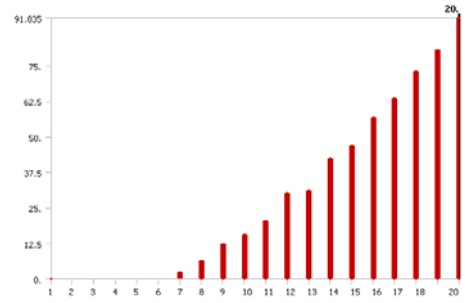
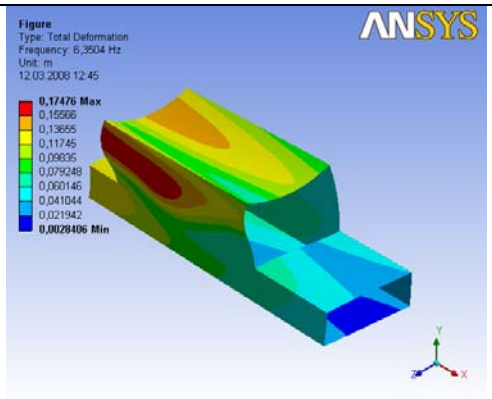
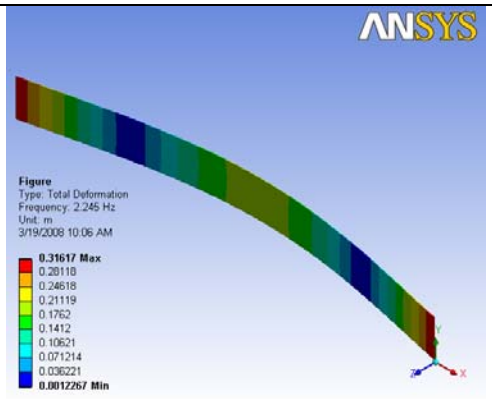
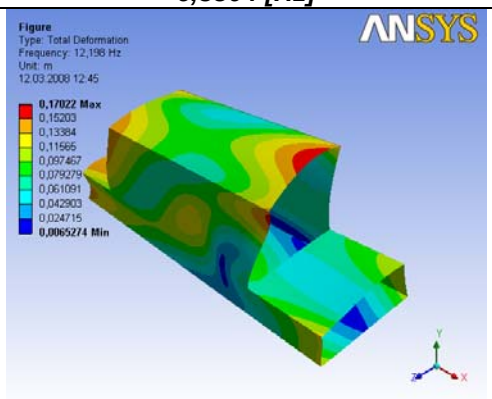
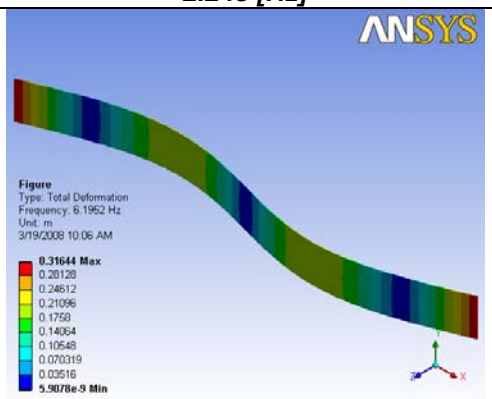
useful the designers for obtained the information concerning the behavior of the complicated structures with most arbitrary solicitations.

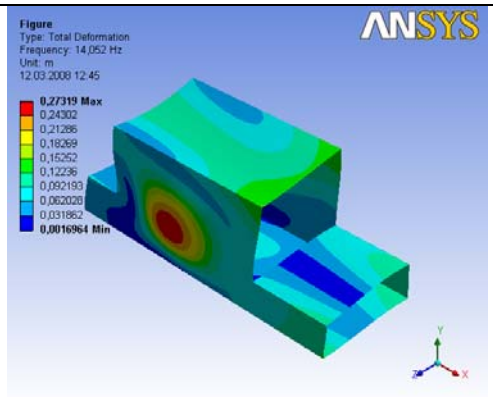
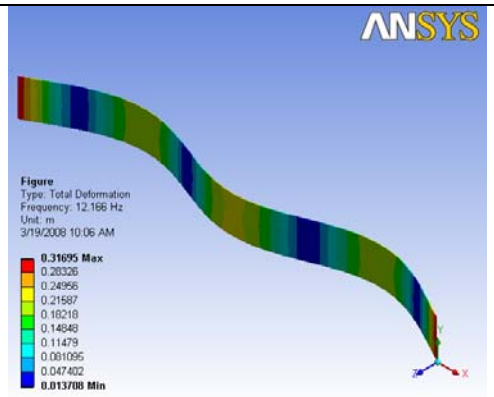
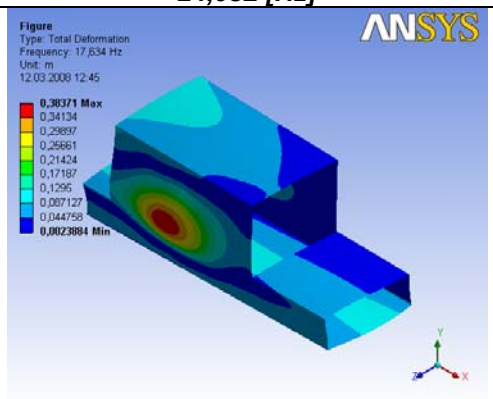
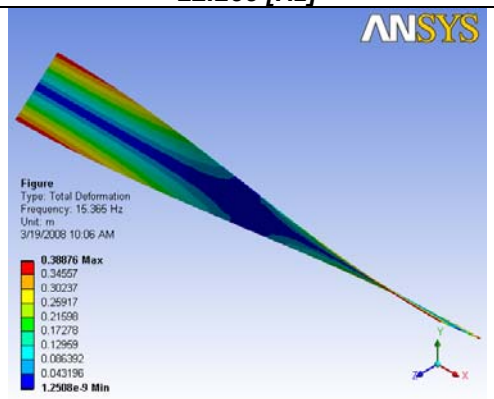
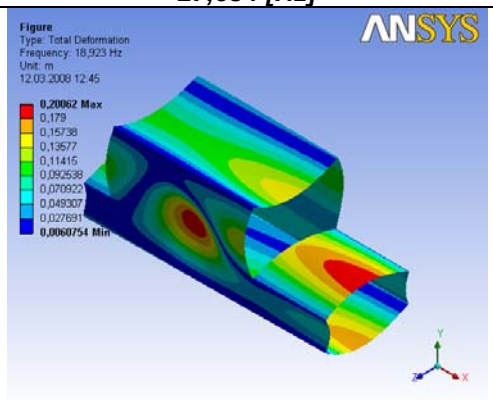
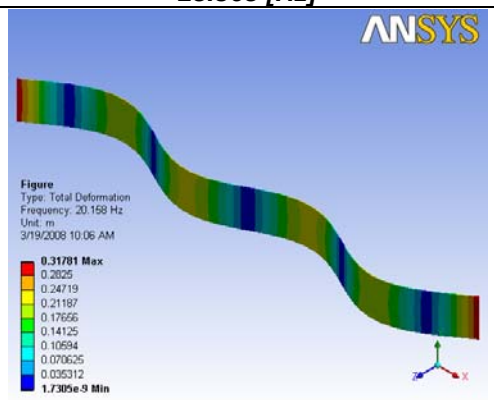
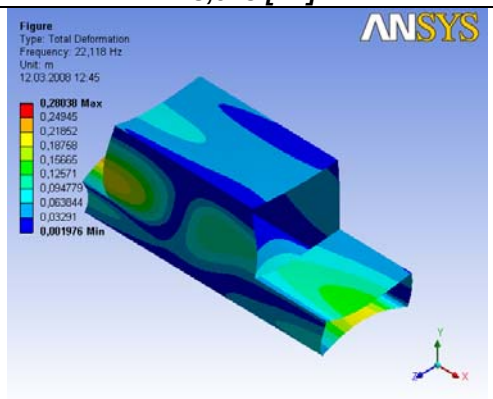
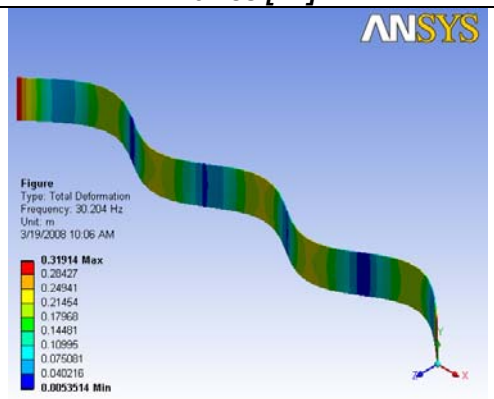
One of the most the general software of analysis with finite element is the cod ANSYS. Make the simulations with assistance of this program with it is an environment of thing what to integrate the activities of projection and of analysis, in the reason to realization the optimize product, it is first pack of program from world, bank on FEM.

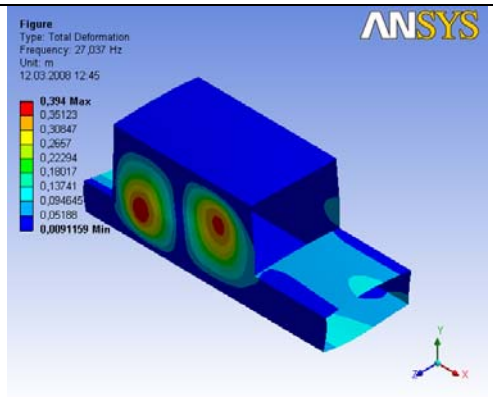
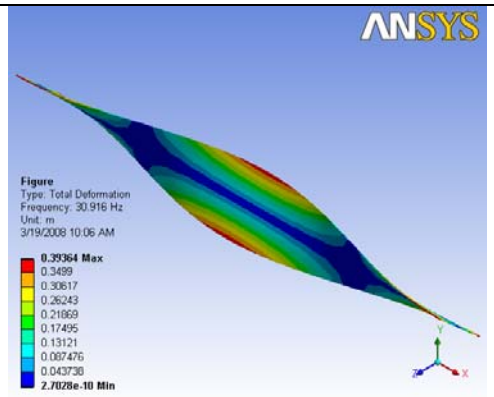
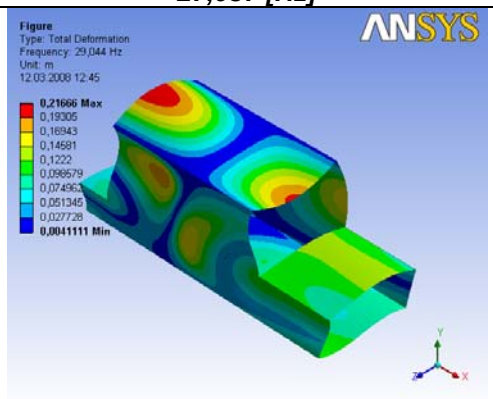
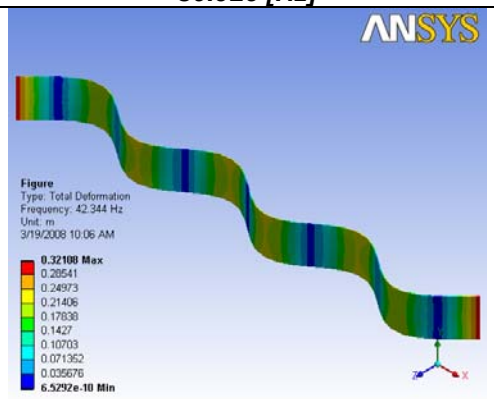
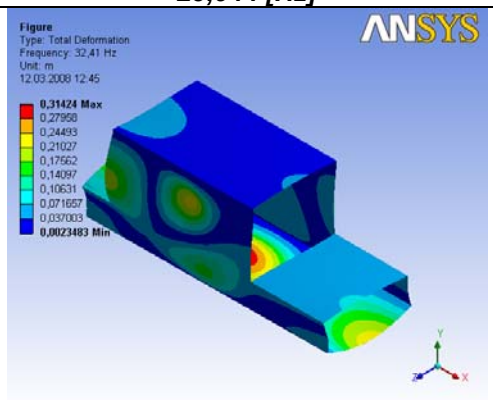
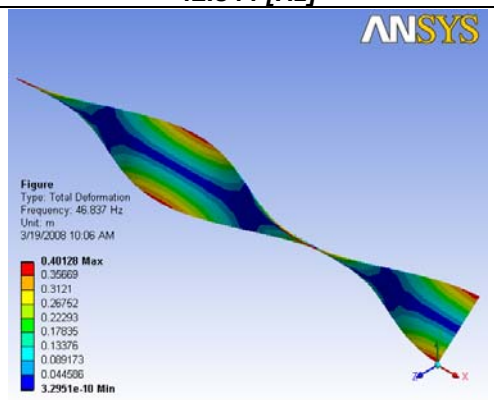
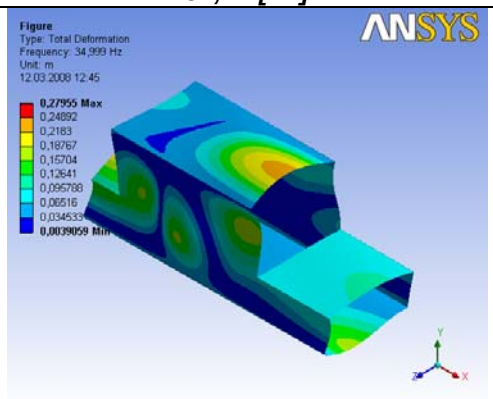
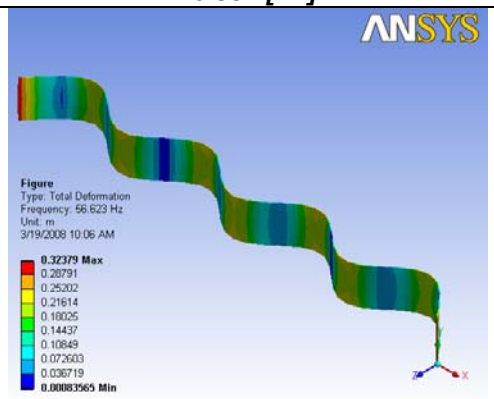
In the ANSYS cod are available 7 types for structural analyze: static analyze; the modal analyze is use from obtain the natural frequency and the deformation mod of structures. In the modal analyze is use the ANSYS WORKBENCH cod; harmonic analyze; dynamic transient analyze; spectral analyze; analyze of flambé; explicit dynamic analyze In the explicit dynamic analyze is use the ANSYS LS-DYNA program whence is an explicit dynamic program; it assures the simulation of problems of non linear analysis, rapid dynamics, with applications in the simulation of technological processes of cupping, smiting, lamination, etc., simulations with impact.

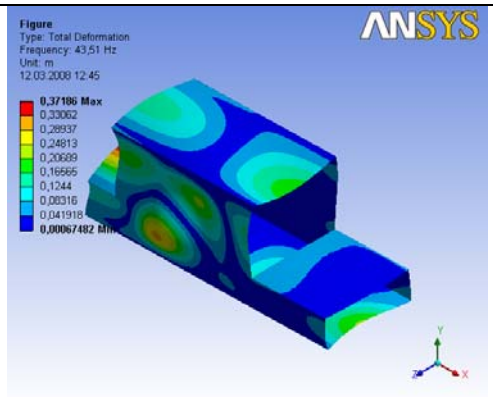
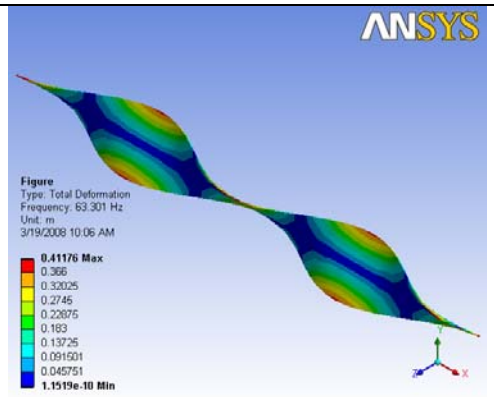
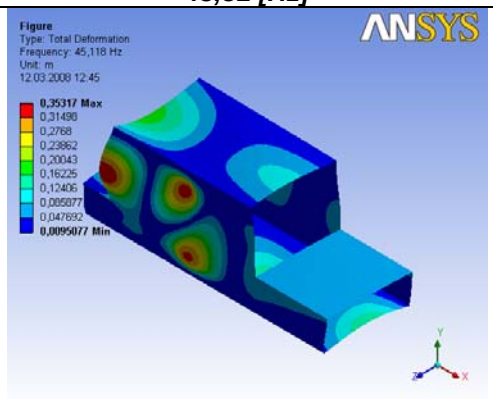
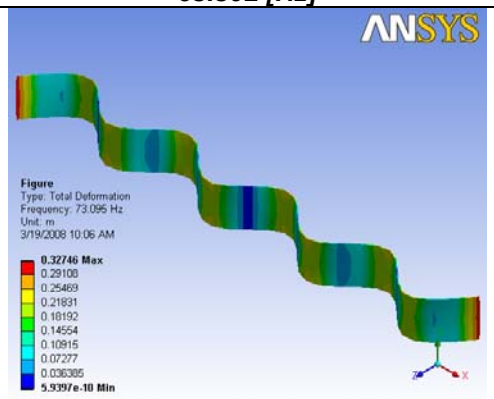
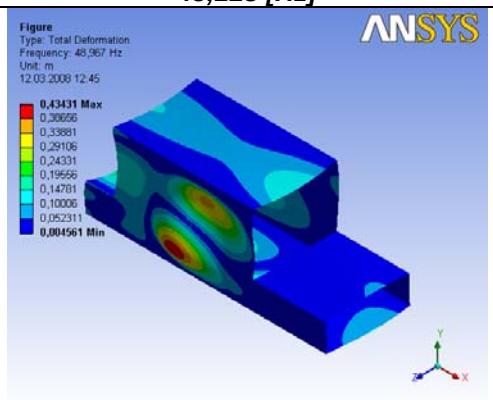
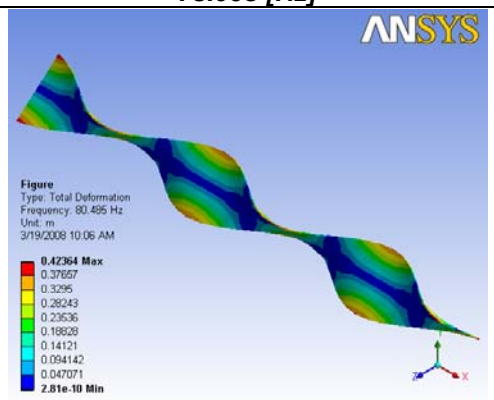
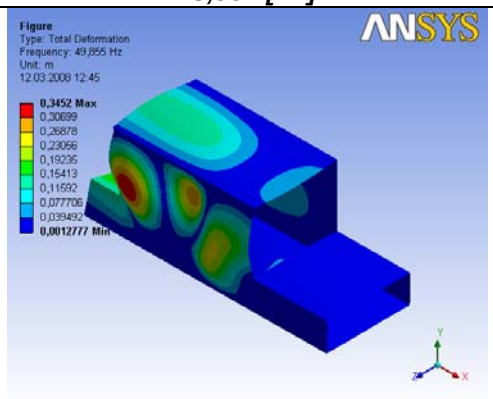
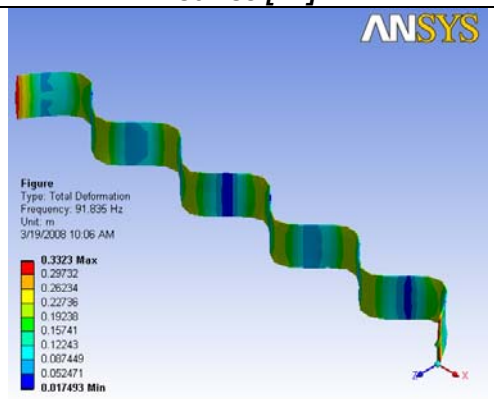
The frequency values of the natural vibrations moods and the natural moods forms, resulting using ANSYS Workbench cod, are represented in table 1.

Table 1

The vehicle	***The parapet***
	
	
6,3504 [Hz]	***2.245 [Hz]***
	
12,198 [Hz]	***6.1952 [Hz]***

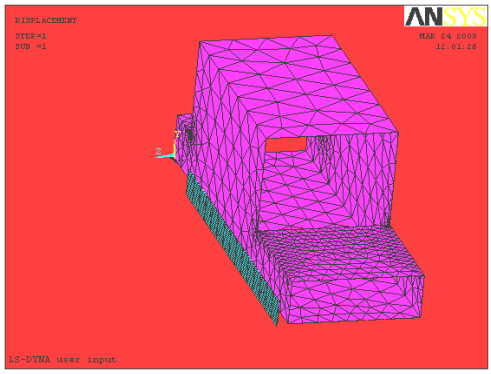
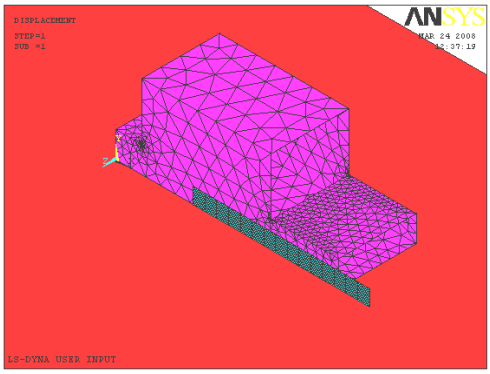
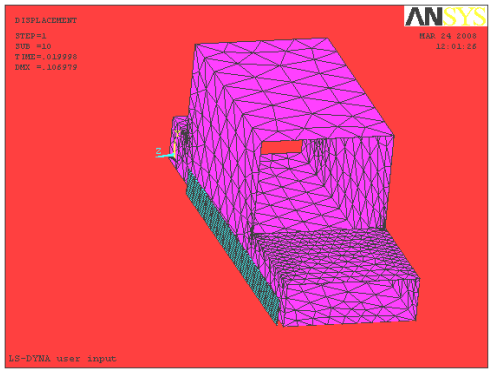
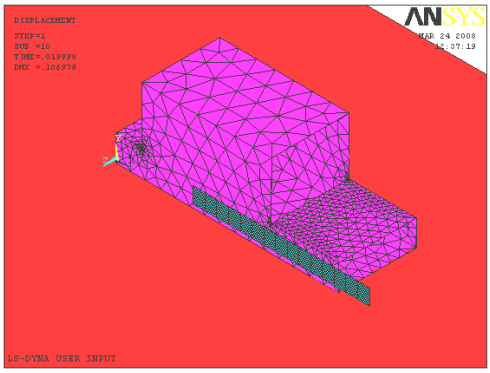
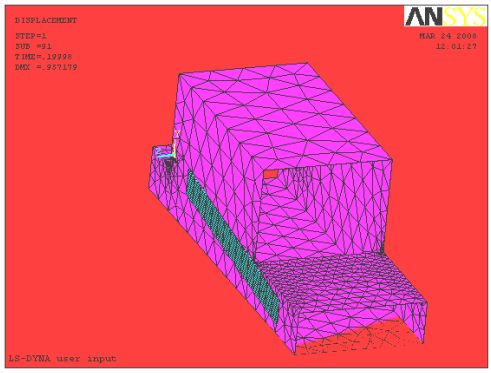
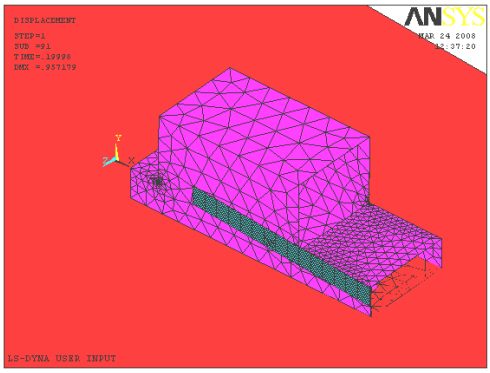
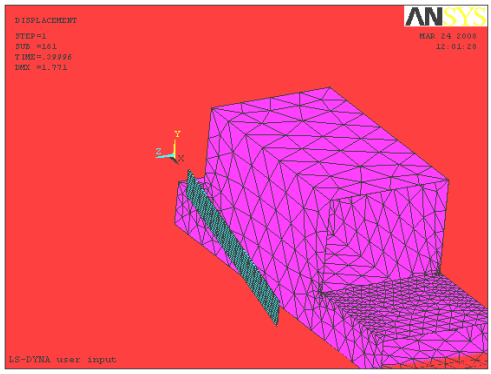
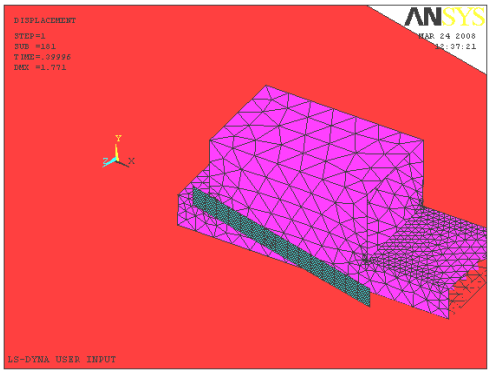
	
14,052 [Hz]	***12.166 [Hz]***
	
17,634 [Hz]	***15.365 [Hz]***
	
18,923 [Hz]	***20.158 [Hz]***
	
22,118 [Hz]	***30.204 [Hz]***

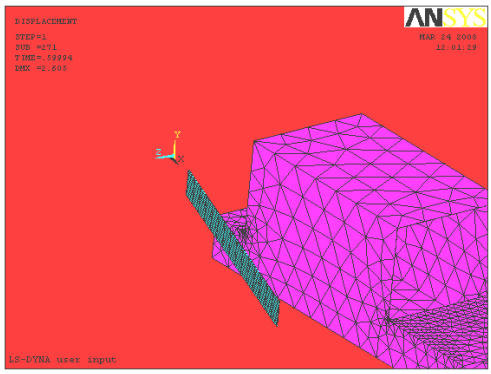
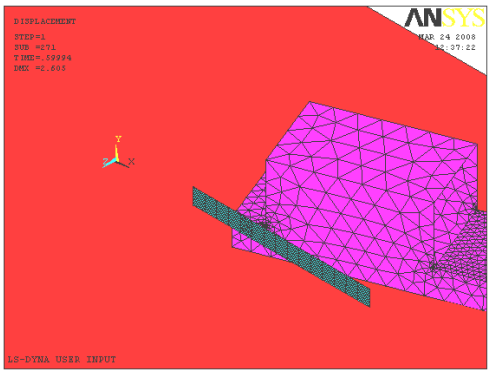
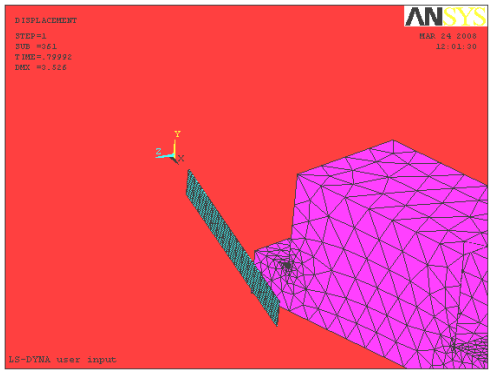
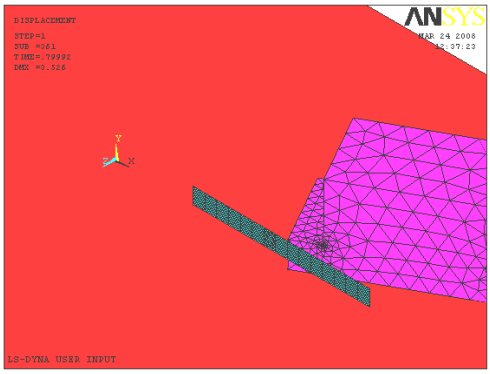
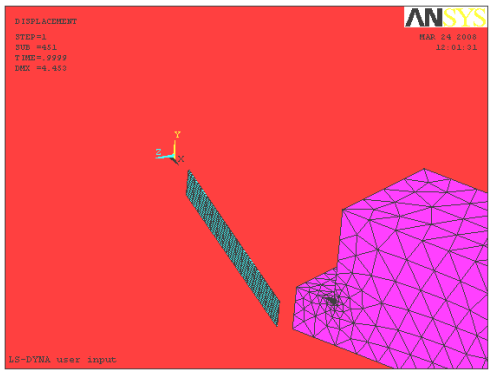
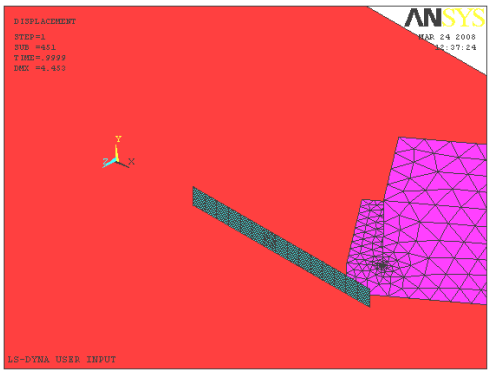
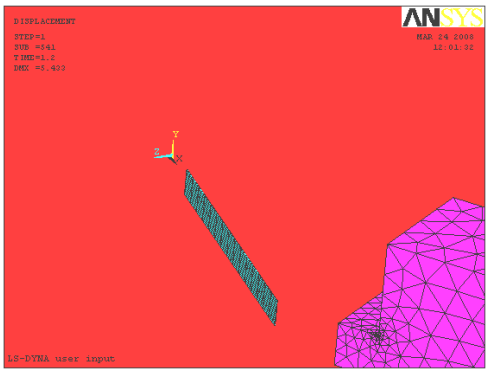
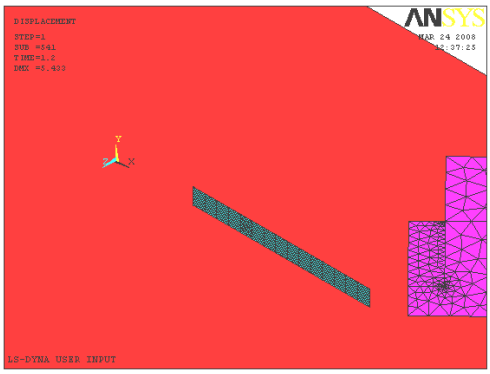
	
27,037 [Hz]	***30.916 [Hz]***
	
29,044 [Hz]	***42.344 [Hz]***
	
32,41 [Hz]	***46.837 [Hz]***
	
34,999 [Hz]	***56.623 [Hz]***

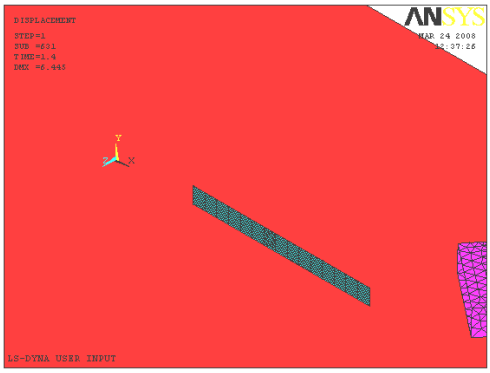
	
43,51 [Hz]	***63.301 [Hz]***
	
45,118 [Hz]	***73.095 [Hz]***
	
48,967 [Hz]	***80.485 [Hz]***
	
49,855 [Hz]	***91.835 [Hz]***

Between the results obtained slowly simulation with help ANSYS LS-DYNA program is presence the evolution of deformation in Table 2.

Table 2

The simulation contact		
Time [s]	***It is define of friction***	***It is not define of friction***
0		
0.019		
0.19		
0.39		

0.59		
0.79		
0.99		
1.2		

1.4		

3. CONCLUZION

The efficiency of Finite Element Method in the numerical simulation, in general, substitutes the experiment, in many cases and at complex tests.

The choosing of ANSYS LS-DYNA program is realized because it comes very well to problems of contact/impact of elastic bodies, problems from which the problem of the considered ring makes part.

Conclusively simulation method is preferred when the analytic study is impossible or too laborious.

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