Composite street lighting columns in road traffic passive safety

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INTRODUCTION

In order to reduce the high accident rate on roads and communication routes in cities, it is necessary to increase the safety of automobiles. On the other hand, once an accident has occurred, it is necessary to minimize the effects of these in order to reduce the severity of injuries and loss of human life.

The systems integrated in the car make it possible to classify safety as active and passive, depending on whether they act before or after the accident respectively.

The elements found on public roads, such as benches, guardrails, lighting columns and others, are susceptible to being impacted by a vehicle.

The active safety elements provide technical aids to prevent the accident from happening, and the vehicle responds adequately to the different traffic conditions.

The following are among the most important elements of active safety:

Braking system
Steering system
Suspension system
Tyres
Motor-gearbox
Traction control
Lateral anti-slip system

When active safety devices have failed to prevent the accident, passive safety devices come into play, which become apparent in the moments immediately following the impact.

The passive safety elements act automatically, reducing in the event of an accident the damage to occupants, pedestrians, animals or urban and road furniture that may be involved in the collision.

Among the most important elements that make up passive safety are the following:

Bodywork
Seats
Inertia-reel seat-belts
Airbags
Passively safe signposts, lighting columns, traffic signal poles, bollards and other passively safe street furniture for all rural and urban roads.


Adhorna's passive safety street lighting columns

EN 12767 - PASSIVE SAFETY OF SUPPORT STRUCTURES FOR ROAD EQUIPMENT-REQUIREMENTS, CLASSIFICATION AND TEST METHODS

The European standard EN 12767 provides a common basis for testing of vehicle impacts with items of road equipment support. Passively safe lighting columns are evaluated and classified by crash testing to this standard EN 12767.

This standard considers three categories of passive safety support structures:

High energy absorbing (HE)
Low energy absorbing (LE)
Non-energy absorbing (NE)



Energy absorbing support structures (HE, LE) slow the vehicle considerably and thus the risk of secondary accidents with structures, trees, pedestrians and other road users can be reduced.

Non-energy absorbing support structures (NE) permit the vehicle to continue after the impact with a limited reduction in speed. Non energy absorbing support structures (NE) may provide a lower primary injury risk than energy absorbing support structures.

Two tests are required to certify a lighting column:

1. Compulsory test at 35 km/h
2. Test at 50, 70 or 100 km/h according to the manufacturer's requirement

What do these tests measure?

1. Acceleration severity index (ASI):
   Value calculated from the triaxial vehicle accelerations, 12 mts distance from the impact.

2. Theoretical head impact velocity (THIV):
   Speed in Km/h, where a hypothetical "mass" occupant impacts the surfaces of a hypothetical occupant compartment.

ADHORNA achieves in 2010 the passive safety certification:

NE-100 Class 2

This enables the product families for roads to be a good choice for road lighting.

CONSIDERATIONS WHEN INSTALLING PASSIVE SAFETY COLUMNS

It is worth investing in passive safety lighting columns when the average daily traffic intensity (ADT) is at least:

> 1,000 vehicles/day, when the speed acquired on the road (or street) is around 60 km/h (or also 50 km/h) and
>
> 700 vehicles/day when the speed acquired on the road is generally and at least 80 km/h.

Energy-absorbing (HE, LE) columns will be preferred on main roads, where there is more pedestrian traffic or trees behind a narrow ditch. On urban roads and streets, with a speed limit of 50 to 70 km/h, passive safety columns (HE, LE or NE), which bend under a car, should be used. Other types of columns can end up falling on the roof of a car when it crashes. Overhead cables reduce the risk caused by a fallen column.

Normally, energy-absorbing (HE, LE) columns are used when there is a sufficiently wide ditch behind them.

It is cost-effective to replace wooden columns with frangible ones when the traffic volume given above is exceeded. When replacing steel columns a higher traffic volume limit must be taken into account, as replacing them is more expensive.

Replacement of columns is not necessary or, in some cases, not possible, when these are

a. behind a safety fence
b. behind a side ditch between trees wide enough, or far enough away.
c. partly deteriorated and the distance between columns is short.
d. They support heavy wiring lines or the aerial wiring angle of a self-supporting pole is wide.

Lighting on obsolete roads with a short distance between columns should be replaced by frangible columns. The reduction in accident and energy costs compensates for the investment in these new columns for four years when the "ADT" is 6,000 vehicles/day or more.

ADVANTAGES IN THE USE OF ADHORNA'S PASSIVE SAFETY COMPOSITE COLUMNS

Impact test performed with an ADHORNA column

The public lighting of city roads involves the installation of vertical structures known as luminaire support columns, which are normally located in the pedestrian traffic space, and very close to the limit of separation with the vehicles' transit route. Hence, the column is an important barrier and a dangerous obstacle for a vehicle that, for some reason, leaves the road and can impact with it causing a serious accident and significant damage, not only material, but also physical on the occupants of the vehicle.

Selecting the optimum material for the production of a vertical structure is not a simple problem. In addition to the rigidity and strength characteristics required for the production of a column suitable for the construction of a street lamp for public lighting, additional conditions are necessary. On the one hand, a material that is not very aggressive to a vehicle that might collide with the column is needed, and on the other, the material must be resistant to the aggression of atmospheric agents, avoiding any type of degradation that reduces the useful life of the street lamp.

Columns made of metallic materials, in particular steel have been manufactured for decades and are currently found in most municipalities. The main problem with these columns lies in the impact behavior of a vehicle, as their energy absorption capacity is very low and their rigidity very high, transmitting a large part of the energy to the collided vehicle, drastically increasing the injuries suffered by drivers of vehicles after the collision.

Columns of non-metallic materials can provide a better solution than traditional metal columns. These are polymer matrix composite materials, more specifically columns made of glass-fibre reinforced polyester (GRP).

Adhorna's GRP columns are light and strong products. In addition, they have a fragile behavior against impact.

The physical and mechanical properties of Adhorna's columns converge in an element closely linked to SECURITY in case of accident, which also provides competitive advantages in terms of reliability, finish, environmental balance and significant savings in maintenance costs.