Passively safe lighting columns

A lighting column does not need to be an obstacle
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In the past, the need to examine roadside obstacles and the safety of road users was not as urgent as it is now. There was much less traffic on the roads, so positioning a lighting column along a motorway without a crash barrier was the order of the day. The installation of public lighting increased safety. It was only later on that the lighting column itself was regarded as an obstacle.

Too many people die in traffic every year. Despite the fact that the numbers of fatalities have decreased over the past few years, every traffic fatality is still one too many.

David Milne, a consultant who advises on passive safety in public spaces explains: “Passive safety is the use of lighting columns, signposts, camera masts and other street furniture which doesn’t kill you or severely injure you when you drive into it. You can walk away after an accident.”

The aim of this document is to provide you with more information on the subject of passively safe lighting columns.

There are many developments taking place in the area of passively safe lighting columns. Passive safety is a complex subject and ideas and insights in this field are evolving all the time.

Chapter 1 in this document describes the CE standards.

Chapter 2 focuses on road situations. Depending on the road situation, the crash classification may vary.

Chapter 3 and 4 describe the foundations and maintenance of passively safe lighting columns in detail.

Lastly, we included a chapter on other passive safe structures.

After reading this document, passive safety will no longer hold any secrets for you.
The development of passively safe lighting columns has been ongoing for more than 40 years, which is hardly surprising given that the amount of traffic on the roads is increasing all the time. In Europe, lighting columns must comply with the EN 40 standard. In addition, a crash test must have been conducted in accordance with the EN 12767 standard. The standard makes a distinction between the following: impact speed (50, 70 and 100 km/h), performance level (HE, LE and NE) and safety for occupant(s) (1, 2 and 3).

If you just want to make a safe choice, the use of a crash barrier is always a good solution. However, this is expensive and it does not always look good. If you decide to use passively safe lighting columns, you can choose from a number of different crash classes. The safest column for a particular road situation depends on the permitted speed, the presence of other obstacles/objects and the possible presence of third parties. The safest column is the best choice not just for the passengers of the colliding vehicle but also for any pedestrians.

At locations where there is a secondary danger behind the column, HE columns are the best choice, if it is not possible or desirable to use a crash barrier. Columns with an NE classification work very well if there is an “empty background”. This NE class can be achieved by fitting the column with a shear off construction, for example. LE columns are often chosen as a compromise solution for county roads. LE columns often naturally possess the right qualities and so require no extra engineered solution, which is very cost-effective.

The test protocol in the EN 12767 standard describes how lighting columns must be tested for passive safety. However, many non-standard situations can be encountered in the field. The main non-standard situations with respect to the test protocol involve the soil type, the vehicle, the collision angle or the installation of the column (too high, too low). The EN 12767 standard makes a distinction between Soil “S” (soil) and Rigid “R” (concrete). To rule out deviations in the soil type (in comparison with the test), the influence of soil variables can be eliminated. For example, this can be done by installing the column into an over-sized plastic tube or ‘sleeve’ or onto a rigid foundation.

To guarantee the performance of passively safe lighting columns, they must be properly maintained. A lighting column test can help to determine the condition of a lighting column. Besides lighting columns, there are also other passive safe products available such as passive safe Traffic Signal Poles and Sign Posts. If you follow the recommendations included at the end of this document, your passively safe columns will help to make the roads safer.
David Milne, a consultant who advises on passive safety in public spaces, says: "Passive Safety is the use of lighting columns, signposts, camera masts and other street furniture which doesn’t kill you or severely injure you when you drive into it. You walk away after an accident."

100LE3 crash with a lighting column in the province of Bergamo, Italy.
Standards for passively safe lighting columns

Passive safety was a Scandinavian development in the 1980’s and 1990’s. In 2005 “TA89/05 Use of Passively Safe Signposts, Lighting Columns and Traffic Light Posts to EN 12767” was published. The development of passively safe lighting columns has been ongoing ever since.

1.1 EN 40
Countries all over the world have different safety standards for lighting columns. Europe uses the EN 40 standard. In addition, a crash test must have been conducted in accordance with the EN 12767 standard. The EN 40 specifies the requirements to be met by every lighting column. This is regulated in ‘Annex ZA’. Annex ZA states that lighting columns must be provided with an identification and that an authorized Notified Body must have approved the product. A Notified Body is a certification institute that has been certified specifically for carrying out product inspections according to the applicable standards. The approval, in the form of a product certificate, must be shown on request.

Amongst other things, the passive safety of a lighting column should be inspected by the Notified Body in accordance with annex ZA of the relevant product standard section in the EN 40 series. As soon as the manufacturer has had low-speed and high-speed crash tests conducted by an accredited test institute in accordance with EN 12767, the Notified Body can assign the safety class. The accredited test institute and the accredited Notified Body are different independent organisations.

It is important when using passively safe lighting columns to make a note of the EN 12767 version. The Annex ZA of EN 40 specifies the mandatory features that must be tested by a Notified Body. One of those features is passive safety, which must be demonstrated by crash tests if it is the intention to classify this feature. If no tests are carried out, the product is automatically assigned to class 0.
1.2 Product standards
For the product standards, EN 40 makes a distinction between the various materials:
• NEN EN 40-4: Lighting columns - Part 4: Requirements for lighting columns manufactured from reinforced concrete and pre-stressed concrete
• NEN EN 40-5: Lighting columns - Part 5: Requirements for steel lighting columns
• NEN EN 40-6: Lighting columns - Part 6: Requirements for aluminium lighting columns*
• NEN EN 40-7: Lighting columns - Part 7: Requirements for composite lighting columns with fibre-reinforced plastics*

* Lighting columns manufactured from aluminium and composite are often naturally passively safe to a certain degree.

1.3 Technical strength calculations
In order to determine whether a column complies with the technical strength requirements, strength calculations must be carried out. Standard lighting columns are calculated for a design life of 25-50 years. The calculation method for columns takes a number of different factors into account, such as materials, wind speed, wind pressure, terrain category and safety factors.

Table 1: Overview of the full EN 40 standard
1.4 Crash tests
The crash test uses a standard lightweight passenger car (mass 900 kilos) and can be carried out using different backfills. The most common backfills are Soil “S” and Rigid “R”. In addition, the client can propose a different backfill under Type X. See Chapter 4 for more information about the foundations.

1.5 Requirements for passive safety
The EN 12767 specifies the requirements and methods for testing passive safety. This standard offers numerous options for classifying roadside structures. It makes a distinction between the following: impact speed, performance level and occupant safety level, as displayed example in Figure 1.

1.5.1 Impact speed
The figures 100 (e.g. for motorways), 70 (e.g. for county roads) or 50 (e.g. for roads in urban areas) refer to the high-speed impact test. For every high-speed test, a low-speed test at 35 km/h must also be conducted.

1.5.2 Performance level
There are 3 categories for passively safe support structures; HE, LE and NE. HE columns absorb as much energy as possible, NE columns absorb as little energy as possible and LE columns are somewhere in between.

- High energy absorbing (HE): HE columns decelerate a vehicle the most but generally also cause the most damage to the vehicle which can result in secondary danger for the occupants. In addition, the occupant(s) will have to cope with a greater impact than in case of an NE/LE column. The exit speed is between 0 and 50 km/h (for a test at 100 km/h), which means that the risk of secondary collisions with trees, pedestrians and/or other road users, for example, is reduced to the lowest possible level. The ultimate HE3 column stops the car (NO exit speed) and at the same time achieves the required occupant safety level.

Figure 1: Passive safety requirements
- Low Energy absorbing (LE): LE columns are columns that usually bend naturally under the vehicle during a crash before they break off or are knocked down.

- Non Energy absorbing (NE): NE columns enable the vehicle to continue driving at a reduced speed after a crash. This reduces the chance of injury to the occupant(s) but increases the risk of a secondary accident if there are obstacles behind the lighting column.

<table>
<thead>
<tr>
<th>Performance level</th>
<th>Occupant safety</th>
<th>Speeds</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Compulsory low-speed test</td>
<td>Speed class</td>
<td>Maximum values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35 km/h</td>
<td>50 km/h, 70km/h and 100 km/h</td>
<td>ASI</td>
</tr>
<tr>
<td>HE</td>
<td>1</td>
<td>1.0</td>
<td>27</td>
<td>1.4</td>
</tr>
<tr>
<td>HE</td>
<td>2</td>
<td>1.0</td>
<td>27</td>
<td>1.2</td>
</tr>
<tr>
<td>HE</td>
<td>3</td>
<td>1.0</td>
<td>27</td>
<td>1.0</td>
</tr>
<tr>
<td>LE</td>
<td>1</td>
<td>1.0</td>
<td>27</td>
<td>1.4</td>
</tr>
<tr>
<td>LE</td>
<td>2</td>
<td>1.0</td>
<td>27</td>
<td>1.2</td>
</tr>
<tr>
<td>LE</td>
<td>3</td>
<td>1.0</td>
<td>27</td>
<td>1.0</td>
</tr>
<tr>
<td>NE</td>
<td>1</td>
<td>1.0</td>
<td>27</td>
<td>1.2</td>
</tr>
<tr>
<td>NE</td>
<td>2</td>
<td>1.0</td>
<td>27</td>
<td>1.0</td>
</tr>
<tr>
<td>NE</td>
<td>3</td>
<td>0.6</td>
<td>11</td>
<td>0.6</td>
</tr>
<tr>
<td>NE</td>
<td>4</td>
<td>No requirements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: ASI and THIV values

The above table clearly shows which ASI and THIV (see explanation on next page) values must be achieved in crash tests for the different performance levels. The exit speed also plays an important role in this. The following table shows which exit speed is permissible for which performance level.

<table>
<thead>
<tr>
<th>Speed at impact (km/h)</th>
<th>50</th>
<th>70</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_e = 0$</td>
<td>$0 \leq V_e \leq 5$</td>
<td>$0 \leq V_e \leq 50$</td>
</tr>
<tr>
<td>LE</td>
<td>$0 &lt; V_e \leq 5$</td>
<td>$5 &lt; V_e \leq 30$</td>
<td>$50 &lt; V_e \leq 70$</td>
</tr>
<tr>
<td>NE</td>
<td>$5 &lt; V_e \leq 50$</td>
<td>$30 &lt; V_e \leq 70$</td>
<td>$70 &lt; V_e \leq 100$</td>
</tr>
</tbody>
</table>

Table 3: Total overview performance level, impact speed and exit speed
1.5.3 Occupant safety level

Occupant safety is expressed in the values ASI (Acceleration Severity Index) and THIV (Theoretical Head Impact Velocity). The ASI indicates the deceleration rate of the vehicle. If a particular ASI value is not exceeded during a test, it can be assumed that occupants have not been seriously injured. The THIV indicates the speed with which the head(s) of the occupant(s) hits the dashboard. Levels 1, 2 and 3 indicate, in that order, the level of increased occupant safety.

The following should be taken into account for occupant safety:

- There is a significant difference between the minimum and maximum THIV values for each level: a THIV of 26 is much higher than a THIV of 14, for example, even though they are in the same occupant safety class. Normally a higher THIV corresponds with a higher energy level.
- Occupant safety is closely related to the performance level of the column. For example, in terms of occupant safety 100NE2 is the same as 100LE3 and 100HE3 (see table 4 on page 16).
- The exit speed can endanger pedestrians, but it can also be a secondary danger for the occupant(s). The residual speed is the speed of the test vehicle measured 12 metres after the collision point.

1.5.4 Risks for third parties

In addition to the (limited) risks for occupant(s), a collision with a passively safe lighting column can also pose risks for third parties. Third parties are at risk if the lighting column (or parts of the light point) can land in traffic after a collision, as well as the risk because the vehicle may still be moving.

Given these risks, the installation of a crash barrier is a viable option. In this case, there are no special requirements for the passive safety of the lighting column positioned behind that crash barrier.

If it is decided not to position a crash barrier, passively safe lighting columns may be used. When a collision occurs, the behaviour of lighting columns (with the same classification) can differ considerably due to the column design and materials. This behaviour is evident in the test report conducted in accordance with EN 12767. The lighting column manufacturer must be able to show these reports (35 km/h and 100 km/h) and the accompanying crash test movies, from which a great deal of secondary behaviour can be derived (such as dents, flying column parts, or vehicles that continue moving).

When deciding where to position a passively safe lighting column, the possible risks when a vehicle drives off the road must also be taken into account. The vehicle might land in the zone behind the column (for example, a flyover or bridge) and pose a risk for third parties or occupant(s).
Example of an HE3 crash test:

When the car hits the column, the car decelerates and the column folds until it breaks.

The extra features inside the column causes further deceleration of the car a few milliseconds after the crash.

“The way passive safe columns behave during a crash depends on the speed of the vehicle and the column materials.”
Practical example with an LE3 column:

On the A66 in the UK, a car collided with an aluminium LE3 lighting column. The column absorbed the impact of the collision, causing minimal damage to occupant(s) and to the vehicle.

Tip:
LE columns often naturally possess the necessary Passive Safe qualities and require no extra engineered features, which makes them cost-effective.
Practical situation with an NE3 column:

A car crashed into a 15 meters high NE3 lighting column. The lighting column was knocked over, as can be seen from the above photographs. The column was damaged, but the occupant(s) were uninjured.

“The THIV value (impact perceived by the occupant(s)) range is the same for NE2, LE3 and HE3, namely between 11 and 27*. The difference between these values is quite extreme. It cannot really be claimed that an NE2 column has the same impact for the occupant(s) as an LE3 or HE3 column. The THIVs of an NE2 column are usually lower than those of LE3 and HE3 columns.”

Bas van Boxtel,
Technical Manager Sapa Pole Products

* See table on page 10.
The use of passively safe lighting columns

The differences between the various crash classes are explained in the previous chapter. But in which road situation do you use which passively safe lighting columns? It is important to choose the right crash classification for the different road situations. In addition, the positioning of a crash barrier must be considered in each particular situation.

2.1 Protecting columns

It may be necessary to protect a lighting column (that has already been positioned) from the road by positioning a crash barrier. This depends to which extent the column is an obstacle, but also what is behind the column. Lighting columns for which the obstacle effect remains within acceptable standards do not have to be protected. These columns can be positioned in the obstacle-free zone (see drawing on page 17) in the verge of the road.

Left: There is possible danger behind the columns, so a crash barrier is necessary. Above: There is less danger behind the column. A crash barrier is not necessary if the column would be passively safe.
2.2 Determining the safety class
The easiest and safest choice is always to position a crash barrier. However, this is expensive, is esthetically not desirable and does not always fit. It also closes the sides of the road which can be a problem in a lot of local situations as well.

If you decide to use passively safe lighting columns, you can choose from a number of different crash classes. The safest column for a particular road situation depends on the speed limit, the importance of occupant safety and the presence of obstacles/objects (such as bridges/walls).

Table 4: Overview of 100 km/h crash classes

<table>
<thead>
<tr>
<th>Safety level for the occupant(s)</th>
<th>100NE3</th>
<th>100LE3</th>
<th>100HE3</th>
</tr>
</thead>
<tbody>
<tr>
<td>100NE2</td>
<td>100LE3</td>
<td>100HE3</td>
<td></td>
</tr>
<tr>
<td>100NE1</td>
<td>100LE2</td>
<td>100HE2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100LE1</td>
<td>100HE1</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: The 3 after NE is better for occupant safety than the 3 after LE or HE. See also Table 2 on page 10.
Note 2: Normally an NE class performs better for the occupants then a higher energy class. So 100NE2 is normally better then 100LE3 or 100HE3.

The above overview describes the main safety classifications. If the degree of occupant safety is important, you should choose a crash class displayed in the top rows.

If the aim of the lighting column is to decelerate a vehicle travelling at high speed and thus prevent secondary incidents, you should choose a safety class displayed in the right-hand column.

For occupants, 100NE3 is the safest option, but if the background is not “empty” (see Figure 2 on the next page), concessions will have to be made. 100LE3 or 100HE3 are then the best options.
2.2.1 HE lighting columns
If there is an obstacle behind the column (see Figure 2), HE columns are the best choice if a crash barrier is not being used. The occupant safety level should be as high as possible (HE3 is better than HE2).

2.2.2 LE lighting columns
HE3 or NE3 are the two “extremes” in passive safety. It is also possible to choose an intermediate solution: LE3 columns. LE columns often naturally exhibit acceptable qualities and require no extra engineered solutions, which makes them very cost-effective.

2.2.3 NE lighting columns
Columns with an NE classification perform excellently if there is an “empty background” (see Figure 2). The highest NE class (NE3) can be achieved by fitting the column with an additional shear off system. In addition, the backfill in which these columns are installed must be at least as stable as the backfill in which is tested. In bends, often side-ways collisions are realistic and NE3 will be the best performing class in these situations.

NE columns are not recommended for roads along which there are pedestrians, cyclists or obstacles like e.g. trees. (such as in the drawing below).

Figure 2: Explanation of the obstacle-free zone on a motorway
2.3 Non-standard situations

The test protocol in the EN 12767 standard describes how lighting columns must be tested for passive safety. The main situations that can deviate from the test protocol involve the soil type (see Chapter 3.2), the vehicle and the collision angle. In addition, non-standard situations can arise because the collision behaviour of a column can change in the course of time. This is discussed in detail in Chapter 4.

Vehicle
The test vehicle described in the test protocol is a standard passenger car that weighs 900 kilos and has an impact height of around 35 cm.

If a column has been installed too deep/shallow there are consequences for the behaviour of the column during a crash. A heavier/lighter vehicle can also have a different impact on the passive safety of a column.

These are important issues that must be taken into account. In this way, an HE column that is supposed to absorb the energy of the vehicle can react in exactly the same way as an NE column if a lorry, instead of a passenger vehicle, crashes into it.

If a shear off system is in the ground (and not above ground according to the installation instructions) the pole might not shear off at all.

Collision angle
The standard specifies a possible collision angle of 20° (assuming that cars leave the road at an angle of 20°). The object to be tested is rotated 20° (in relation to the installation in the field) in order to test it correctly.

In practice, however, a vehicle can also collide with a column from the side (see the photographs on the next page).

If there is a shear off construction in or on the column, to make it eligible for NE3 classification, it is extra important that this structure is direction-insensitive.
Example of NE3 crash test, lateral collision:

A Ford Fiesta (35 km/h) crashed into an NE3 lighting column from the side. This is a crash test demonstration conducted in the UK that shows the shear off behaviour in case of a side impact.

“All EN 12767 crash tests are conducted frontally, while side collisions (often at low impact speed) have much greater consequences for occupant(s).”

Bas van Boxtel, Technical Manager Sapa Pole Products
Practical situation LE3 column:

A car crashed into this LE3 column on the A29 Shripney Road (in the UK).

Because of the low speed of the car, its impact was “absorbed” by the LE3 column.

“On paper, the choice of a particular type of passively safe column in a particular situation seems logical. In practice, however, this has to be assessed for each location”.

Bas van Boxtel,
Technical Manager Sapa Pole Products
Foundations for passively safe lighting columns

Every country has its own way of building foundations. There are many different soil types and installation techniques. They depend on the water levels and the extent to which the soil is compressed. In many countries, concrete foundations are used, but in some countries lighting columns are planted in soil. For both methods, the EN 12767 prescribes backfill types. In this chapter, we discuss the different foundation methods.

3.1 Soil and Rigid
Annex A of EN 12767 makes a distinction between two foundation methods: Soil “S” (soil) and Rigid “R” (concrete).

Soil “S” is a standardised soil with a specific composition and density. When positioning a column in soil, it is important to remember that the composition of the soil is not homogenous. There are different soil types with different groundwater levels. In all cases, these are different to the soil that was tested (Soil “S”). In addition, the temporary presence of rainwater, for example, can also affect the stability of the soil.

In the case of Rigid “R”, the lighting columns are installed both on and in a concrete foundation. This can be achieved by sockets, sleeves or baseplates.

The passive safety of lighting columns is tested in normalised situations. In practice, the soil composition or road situation is almost always different. You can read more about this in the next section.
3.2 Non-standard foundations
As mentioned above, in EN 12767 Soil “S” (soil) and Rigid “R” (concrete) are specified as possible lighting column foundations. All types of foundations that deviate from this come under Type X in the Standard, such as saturated soil, clay or gravel.

Sleeved foundation
To rule out deviations in the soil type (compared to the test determinants), the influence of soil variables can be minimized by installing the column into an over-sized plastic tube or ‘sleeve’. For shearing NE3 poles this can be done using a concrete element, for example. The element consists of at least 500 kg concrete of minimal C20/25 quality and creates a stabilising structure around a vertical column.

By positioning enough concrete around an NE3 column with a shear off construction (which was originally tested in Soil “S”), all the variables in the soil are eliminated. This guarantees the NE3 classification.

Be aware that not all cases which use additional foundation stability will improve the performance. For example, an HE pole tested in soil can perform worse in concrete, because it can break more easy during high speeds or not move away during low speeds.
CHAPTER 4

Maintenance and durability of passively safe lighting columns

To a greater or lesser extent, lighting columns almost always require maintenance and passively safe lighting columns are no exception. This depends on the types of materials used to manufacture the column, the presence of coatings, type of root protection and the location of the column.

4.1 Inspecting and cleaning columns
According to the EN 40, a lighting column is calculated to have a life span of 25 years. During those 25 years, the lighting column materials are subject to corrosion as a result of environmental factors, such as weather effects, stray electric currents, aggressive soil composition etc. That is why it is important to manage and maintain the columns properly.

Regular cleaning, painting where necessary (see the manufacturer’s maintenance instructions) and inspections are important to ensure that lighting columns remain in good technical condition.

To determine the condition of a lighting column, especially the invisible root-section, the column can be tested in order to postpone replacement of the column at the end of its technical life.

However, a lighting column test is not indicative of a column’s shear off or energy absorbing behaviour.
4.2 Long-term performances

The classification of passively safe lighting columns is based on normalised situations. In practice, factors that affect the performance of the lighting column play an important part, meaning that the column may not perform as expected. The following table displays a number of factors with their possible consequences.

<table>
<thead>
<tr>
<th>Factors (causes)</th>
<th>Possible consequences of a collision (when installed in Soil “S”)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A changed product (e.g. corrosion)</td>
<td>The column may break or an NE3 structure cannot shear off or slide away.</td>
</tr>
<tr>
<td>Different backfills (e.g. composition, density, groundwater level, frost)</td>
<td>The column can be knocked out of the ground or can be broken. An NE3 column will probably not shear-off and an HE3 column can break too soon.</td>
</tr>
<tr>
<td>Non-standard vehicle or non-standard impact (e.g. lorries, buses, heavy passenger cars or side impact)</td>
<td>The column can react differently than expected. Heavier cars result in more impact energy and impact the pole at higher level than a passenger vehicle.</td>
</tr>
<tr>
<td>Deviations in positioning (e.g. height, compaction, saturation, collision direction)</td>
<td>A mechanism in (or on the outside of) the column does not work at all or is reacting differently than intended (see page 19, for example).</td>
</tr>
</tbody>
</table>

Table 5: Factors and consequences in practice

Passively safe lighting columns are often supplied with constructions in or on the column, so that they are eligible for NE or HE classification. These constructions may be located in the soil or on the outside of the column or may be designed to be fitted on the inside of the column. If and when dirt, water, salt or sand penetrate the construction and cause it to corrode, the column will probably no longer perform as well as it did during the test.

For example, an HE column that is locally affected by corrosion may lose its function, which means that the column cannot “absorb” a vehicle as effectively. The column may then perform more like an NE column, with all its consequences.

Conclusion: due to various factors, in the course of time there is a risk that the column may not perform as well as it did during the tests. To guarantee the long-term performance of passively safe columns, the columns must be maintained properly.
Other passive safe products

Not only lighting columns, but also other roadside objects can be passive safe. Examples of these objects are Traffic Signal Poles and Traffic Sign Posts. With around 15% of highway fatalities caused by vehicles striking roadside objects, it is important that the application of passively safe structures is considered whilst designing traffic signal (or other) installations.

5.1 EN 12899
The Standard for Traffic Signal Heads is EN 12368. The Standard for Variable Message Signs is EN 12966. And the Standard for Fixed Vertical Message Signs is the EN 12899.

For the structures used for the applications above the relevant Standard is EN 12899-1. These support structures need to be certified according to this Standard since July 2013.

For Passive Safety the EN 12899-1 refers to EN 12767.
Example of a Traffic Signal Pole crash test:

At Traffex Live in 2014, this 6m 70NE 2 Raise and Lower Aluminium passively safe Traffic Signal Pole was demonstrated. The pole was impacted by a 1500 kg Mondeo saloon car at 70kph. The signal pole collapsed as designed, with minimal deceleration to the vehicle, thereby protecting any potential vehicle occupants from serious injury.

In the same test also the electrical disconnection was tested.

“The demonstration clearly proved the life saving capabilities of the pole, all electrics were isolated within 0.2 seconds of the impact and the ease with which damaged poles can be removed from the Retention System, making this type of installation both cost effective and invaluable for Signal Maintenance organizations.”

Traffex Live 2014
This is an example of a crash demonstration at MIRA (May 2012) of a 100 NE2 Shored-up multi-legged Sign Post. It clearly shows that the vehicle drove through the aluminium structure. The structure was crashed into using a 1500kg (Heavy) vehicle at 100kph - the Sign Plate size was 4.5m wide, 7.5m high.

“Especially the big Sign Post structures can cause serious injuries when hit by a vehicle. This always needs to be considered when designing a road.”

Bas van Boxtel, Technical Manager Sapa Pole Products
Nowadays, with over 31 million cars on the UK roads (with this figure still rising), it is vitally important to make the safest choices when it comes to public lighting and other roadside objects.

We recommend the following when the use of passively safe columns is considered:

- Always ask for a valid certificate that specifies the safety classification and states whether it is based on the most recent EN 12767 or EN 12899 (in case of Traffic Signals and Sign Posts).
- Check that the certificate has been signed by a Notified body.
- Ask to see the applicable test reports (35, 70 or 100 km/h).
- Ask to see the report of the low-speed test. In many cases, this is more critical than the high-speed test. For example, shear off constructions (NE3) and absorption systems (HE3) are determining factors for classification.
- Ask to see the collision movies of the official crash tests. While watching the films, you can often clearly see differences between the behaviour of the various shear off constructions and absorption systems. One 100HE3 column will perform in a different way to another 100HE3 column.
- Ask for the exit speeds and movies so that you can see the dents in the vehicle. After all, these types of side-effects cannot be extracted from the classification data, but they can still cause very serious injuries to occupants.
- Compare the local foundation situation with the test foundation.
- Make sure that the columns are installed carefully.
- Keep the “external” shear off constructions clean.
- Follow the column supplier’s maintenance recommendations.
- Choose the column type that best suits the relevant road or road situation.
- Make sure the columns are regularly tested on the effects of degradation (e.g. corrosion).

When you make a well-considered choice for passively safe columns by taking the above recommendations into consideration, the columns will increase the safety level without becoming an obstacle.

Sapa Pole Products
Drunen, October 2015
Would you like to know more about lighting columns or road structures?

Please feel free to contact us to make an appointment.
• Publication SWOV 1977 “Obstacles along the road” (Dutch)

• BS-EN12767-2007, ISBN 978 0 580 62091 1

• Handboek lichtmasten (Verkeerstechniek CROW), publication 215, August 2005, ISBN 90 6628 450 1 (Dutch)

• EN 12767: Passive safety of bearing structures for road equipment – Requirements and testing methods -- overview & solutions – (OCW 1/9/2009)

• Bermwijzer Maart 2006, publication of Steunpunt Veilige Inrichting van Bermen in Utrecht (Dutch)

• Report: The use of passively safe signposts and lighting columns, EN 12767 – passive safety of support structures for road equipment

• Various articles published in specialist journals

Websites:
• UK Roads: http://www.ukroadlighting.com/
• Nando: http://ec.europa.eu/enterprise/newapproach/nando/
• Traffex Live 2014: http://www.ukroads-traffex-live.com