Stratec RT
ROAD TECHNOLOGIES

ConcreteSleeve
GroundSleeve

Stratec RT's safe guardrail sleeve technology

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Stratec RT

ROAD TECHNOLOGIES

INNOVATION AND SAFETY ON THE ROADS OF THE FUTURE

STRATEC RT creates ***innovative technologies and products*** *that improve road* ***quality*** *and* ***safety****. It is with this objective that* ***STRATEC RT*** *realizes all its* ***patents****.*

THE UNIVERSAL SOLUTION TO THE DEADLY AND COSTLY PROBLEMS WITH TODAY'S GUARDRAIL SYSTEMS

Too often the ***"guardrails"*** installed along the world's roads and highways do not meet the technical safety requirements as a rule. A lot of installations don't reflect the conditions of certification, with serious risk for the consequences of possible accidents, also for the managing body of the roads.

Actually, the known art is satisfactory regarding the materials and the elements with which the guardrails are built. In fact, the technology for the realization of the guardrails is mature, reliable and optimized respect the costs: but the technical problems around the installation and maintenance is still open and not yet solved and often does not replicate the ***"Crash Test"*** certification conditions, due to different types of soil and often not reliable connections used in concrete curbs.

STRATEC RT's new patented technologies all share a common goal: Innovation on the market, compliance with the guidelines of the Crash Tests and legislation, quick and easy installation, high safety, meeting efficiency standards and low maintenance costs. Current and future unique STRATEC RT products encompass proprietary designs which yield all the substantial benefits as described below.

Road guardrails are normally subjected to compliance with appropriate mechanical standards which, only after being certified by means of "Crash Tests", allow to consider the standard guardrail and consequently guarantee adequate safety standards. Specifically, a "guardrail" must prevent the road exit of the vehicles and their overturning and, at the

same time, must be able to absorb and dissipate by mechanical deformation all or part of the kinetic energy possessed by the vehicle at the time of impact, by reducing the deceleration induced by the impact to the occupants of the vehicle, and allowing its gradual return to the roadway by stopping the race.

To date, much attention has been paid to the verification of the congruence of the installation of the various ***"over-ground"*** guardrail elements, checking connections and geometry of the system (post, tape, spacer, upper tube, etc.), while little attention has been paid at the base of the safety guardrails, with focus on both: the curb and on the ground.
In truth, the type of connection on the foot is the most important and determining aspect for the correct triggering of reaching the yield point on the upright of the guardrail system. For example, an unforeseen break of a traditional anchor (in the type "on concrete curb") or reaching the yield point on a post to a different depth underneath the ground as in the certified Crash Tests (in the "on-ground" type) is sufficient, in case of an accident, to transmit totally different stresses, deformations and related mechanisms not conforming to the certified guardrail system, with all the consequences for the involved companies and people (designers, operators, institutions, construction companies, etc).

THE MANY PROBLEMS POSED BY TRADITIONAL WAYS TO REPAIR GUARDRAIL POSTS IN CONCRETE CURBS

Often the traditional repairs to guardrails in cement curbs, with plate and chemical bolts, does not always guarantee compliance with the certification conditions:

on **existing concrete curbs**, using a hole with core drill and grouting the posts with expansive cement mortar for a minimum depth of 25 cm, using chemical anchors with a pole on a plate;

on **new curbs**, by preparing, before casting the concrete, the anchor bolts in the case of poles on a plate or posts.

Consequently, the overall performance of the guardrail results in many problems and difficulties, such as:

- **Long time for the execution of the works**, which generate higher risks for safety during the work especially at the post-accident construction sites.

- **Impossibility to guarantee compliance with the certification conditions** and consequently the overall performance of the guardrail, if during the execution of the works the same procedure and the same laboratory conditions are not applied like during the certification tests, on each hole, anchor bolt, type and quality of the chemical anchor, method, ambient temperature, fixing times, etc.

- **Drilling often does not comply with the conditions of certification** due to the non-perpendicularity of the holes because obstructions by irons/reinforcements, which do not allow the correct direction and depth of the hole itself, which requires a reduction in length of the anchor bolt.

- **Potential removal of the anchor bolts from the concrete curb** due to lack of accuracy during assembly with consequent non-compliance with the certification conditions (often happens that the anchor bolts are cut due to unforeseen problems during the construction work, by compromising the safety standards).

- **Chemical anchors potentially not-compliant** due to the incorrect procedure for inserting the anchor bolts in the holes, for the non-congruity in the continuity of the anchor glue thicknesses and the potential non-full compliance with the curing times, also in relation to the temperature and humidity on site.

- Potential risk, that the polymerization of the chemical anchor glue cannot be guaranteed when the anchors are pretensioned not respecting the hardening time, the temperature variation and/or the same chemical products have not an adequate and/or different quality.

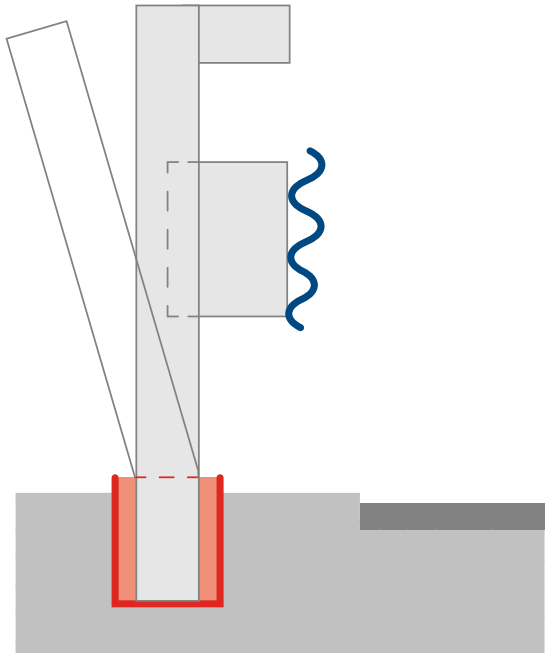
- In case of accidents and/or replacement of guardrails, there exists the need to cut the anchor bolts in order to remove the pole on the plate with reconstruction of the concrete curb or by changing place of the plate and anchor bolts (which will not correspond any more to the certified guardrail) with related costs, lengthening of the times for the safety precautions while maintaining the building site.

THE UNIVERSAL SOLUTION CONCRETESLEEVE

"ConcreteSleeve" is a metallic guide used at the base of the guardrail that revolutionizes guardrail installation, substitution and maintenance along the road. "ConcreteSleeve" guarantees everywhere the same safety standards, much more speed of installation, sustainable costs, an easy replacement of the posts themselves after accident or for maintenance reasons and is corrosion resistant.

ConcreteSleeve extremely simplifies all the installation jobs around the concrete curb. The post is not only quickly installed, but also very easy to remove.

With **"ConcreteSleeve"** in case of accident the deformation of the uprights will always occur in the same position as in the Crash Test, guarantying the same behavior for all safety guardrail parts as a system and consequently compliant with the certified safety standards.



ConcreteSleeve on concrete curb

THE ADVANTAGES OF CONCRETESLEEVE

Direct connection to the reinforcement of the concrete curb guarantees the same position, continuity of the whole structure due to the same stable position and safety conditions over time.

Safeguarding and legal protection for the managing body of the road infrastructure in case of road accidents thanks to the right behaviour of the guardrail system.

Maintaining the correct behaviour of the post as in the certified Crash Test by reaching the correct yield point always in the same position, thereby ensuring compliance with the regulations in every situation and/or condition.

Easy positioning and quick mounting/fixing of the guardrail post. The rapid replacement of the post saves significant time with low maintenance operations and also their changing in the case of post-accidents, avoiding reconstruction work on the concrete curb.

TRADITIONAL POSTS INSTALLATION

For the installation on the ground, the Crash Tests are carried out with reference to the only specific resi- stance class of the laboratory, certified both according to CNR-UNI 10006 and according to CNR 146/92 (load test on plate). As the vehicles and the standard impact conditions vary, the installation terrain does not change. It follows that the certification of the different types of guardrails is considered valid only for the particular type of soil present in the crash laboratory. This currently determines the widespread problem of the mismatch of real installations with standard Crash Test conditions, with guardrails behaviour in the event of a collision that are potentially very different from those expected and certified, with important consequences in terms of liability in case of accidents.

The production and marketing of road safety guardrails is regulated by the CE marking in accordance with current legislation on construction products. In the case of road containment systems, marking is carried out in accordance with the tests listed in the appendix ZA of UNI EN 1317-5 harmonized 2 to Directive 89/106 / EEC on construction products (CPD).

A correct behaviour of the guardrail, therefore, must allow the achievement of the correct yield point of plastic deformation to the upright just below the ground level, indicatively as in the certified Crash Test. In any case, regardless of the optimum formation point of the correct yield point of plastic deformation, which may also depend on the specific "guardrail" model, the essential is that the energy absorption observed during the conditions of certification is taking place. Only the correct deformation of the upright, in fact, allows the correct triggering in succession of the mechanisms of the "guardrail system" and therefore the containment of the vehicle, avoiding both the dangerous return to the roadway and the road exit with serious consequences.

TRADITIONAL POSTS INSTALLATION: DANGER OF RIGID ROTATION OF THE POSTS

Impossibility to guarantee compliance with the certification conditions and consequently the overall performance of the guardrail in case of installation on grounds which normally have always different properties.

Potential rigid displacement of the upright without formation of the plastic hinge and consequently non-compliance with the certification conditions.

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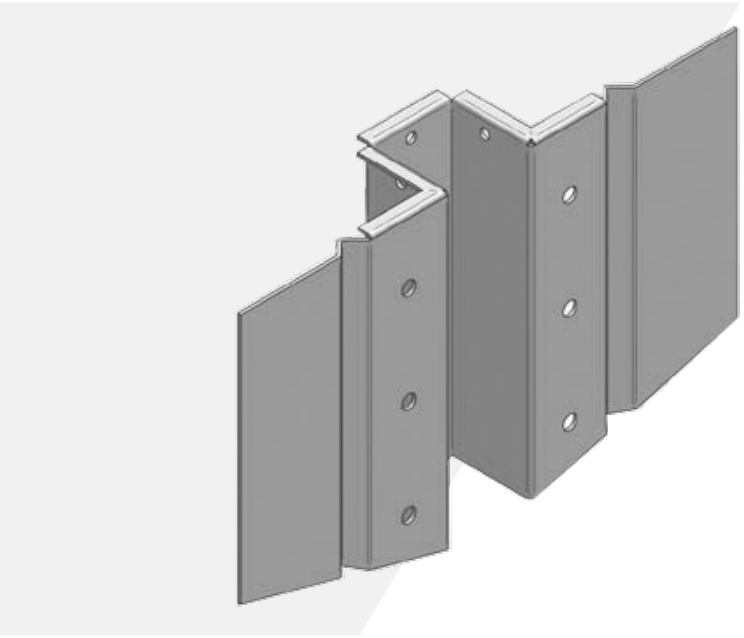
The tightness of the installation depends on the compactness and the characteristics of the ground which, if not particularly compact, modifies the behaviour of the road guardrail in the case of vehicle impact. In this case, in fact, the uprights, not being stable in the ground, as a result of the impact of road vehicles, will tend to rotate rigidly in the ground (instead of flexing and reaching the correct yield point), reducing its deformation capacity and therefore the capacity to absorb and dissipate the necessary amount of kinetic energy, with possible leaking and overturning of the vehicle.

THE UNIVERSAL SOLUTION GROUNDSLEEVE



"GroundSleeve" is a spade-shaped metal reinforcement system at the base of the upright which has the purpose of covering a greater area of terrain. This is determining a higher resistance of the "Guard Rail" system as a function of a greater volume of earth to be moved and permitting the achievement of the correct yield point which represents actually the critical point of the installations of guardrails on a ground often with low quality; consequently, the installation do not corresponds to the Crash Test norms 1317, where the ground has always the same characteristics of high solidity and resistance. On narrow roadside the problem is much higher because the lower quantity and soil quality where the post can easily have a rigid dangerous rotation.

The uprights are generally fixed nearly always in different soils with different methods, e.g.: on narrow shoulder extending the uprights, with reinforcement pipes of different lengths

That doesn't solve the problem.

GroundSleeve represents, for the re- solution of known problems on road safety, an absolute innovation in the sector. This system is designed for allowing the uprights in the event of a real impact the triggering of the deformation mechanisms of all the components very similar to the certified Crash Test and safety standards.

Every **GroundSleeve** must be necessarily studied and configured based on the type of upright, ground characteristics, distance to narrow roadside, slope of the shoulder and other potential issues on side.

STRATEC RT's **GroundSleeve** system respects the standard EN 1317-5 as it doesn't alter the geometrical and mechanical features of the certified guardrail but intervenes just on the ground to guarantee a greater impact resistance.

THE ADVANTAGES OF GROUNDSLEEVE

Optimal connection at the base and plastic deformation of the moment the guardrail post is banned like in the **Crash Test.**

Safeguard and legal protection for the road infrastructure operator in case of road accidents.

Adaptability, both geometrically and structurally, to all sections of posts on the market.

In the event of a vehicle crash, the system remains in place and intact.

With the supply of the product, STRATEC RT offers, depending on the project, the proper design and calculation of the GroundSleeve system for free.

Quick and simple installation of the system with the traditional "pile driver" with the possibility of inserting the GroundSleeve also by existing installations, without the need to disassemble the post and / or guardrail.

INSTALLATIONS PHOTOGALLERY CONCRETESLEEVE & GROUNDSLEEVE

FIG.1

Installation detail

FIG.2

The photo shows an example of an application. Every type of guardrail needs a GroundSleeve properly dimensioned and designed, a service STRATEC RT offers for free.

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