

## NEW CONCEPTS IN THE REALIZATION OF PLANTATIONS WITHIN ROADS AREA

### CONCEPTE NOI ÎN REALIZAREA PLANTAȚILOR ÎN ZONA DRUMULUI

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**Abstract:** In general, the plantations raise multiple technical problems, which are quite complex since the plantations represent a natural protection directly influenced by rough weather actions and noxious effects produced by road traffic. The paper presents a new approach of the realization of plantations and refers to new ways of realizing them, taking into account the role the plantations play in the road aesthetics and in the safety of road traffic and the protection of roads against rough weather conditions (snow storm, high temperatures, etc.). In addition, it has been studied the realization of plantation shelter belts in the areas considered to be predisposed to snows or wind actions, the belts being composed by rows of scrubs or short-sized plantation in order not to endanger human lives in case of traffic accidents. The paper proposes this manner of positioning the plantation after having attentively analyzed the traffic accidents caused by the existing plantations and after having counted sectors predisposed to snow-drift and calculated the cost of maintaining the roads' stability in these situations.

**Rezumat:** În general, plantațiile pun numeroase probleme tehnice, care sunt cu atât mai complexe cu cât plantațiile constituie o protecție naturală supusă direct acțiunilor intemperiilor și efectelor nocive produse de circulația de pe drumuri. Lucrarea prezintă o abordare nouă de realizare a plantațiilor și face referire la modalități noi de realizare a acestora, având în vedere rolul plantației pentru estetica rutieră și siguranța circulației rutiere și protecția drumurilor față de intemperiile atmosferice (zăpadă viscolită, temperaturi ridicate, etc.). De asemenea s-a studiat realizarea perdelelor de plantații în zonele inventariate ca fiind predispușe înzăpezirilor sau acțiunii vânturilor, perdele realizate din rânduri de arbuști sau plantație de talie mică pentru a nu periclita viețile omenești în caz de accidente rutiere. Lucrarea propune acest mod de realizare a plantației după ce s-a făcut o analiză foarte atentă asupra accidentelor de circulație cauzate de plantațiile existente și după ce s-au inventariat sectoarele înzăpezibile și s-au calculat cheltuielile efectuate cu menținerea drumurilor în stare de viabilitate în asemenea situații.

**Key words:** plantation, plantation shelter belts, road  
**Cuvinte cheie:** plantație, perdele de plantații, drum

#### INTRODUCTION

The plantations for roads are included within the group of road construction works, being the object of special projects all the more so as an important part of the road area (50-60%) is constituted by vegetation.

In general, the plantations raise multiple technical problems, which are quite complex since the plantations represent a natural protection directly influenced by rough weather actions and noxious effects produced by road traffic.

The paper presents a new approach of the realization of plantations and refers to new ways of realizing them, taking into account the role the plantations play in the road aesthetics and in the safety of road traffic and the protection of roads against rough weather conditions (snow storm, high temperatures, etc.).

The conclusion of the studies done by the authors is that the present way of placing the plantations on one row at distances between 20-35m has several impediments such as:

- it is a real danger for the traffic participants in case of accidents;
- it does not ensure the road protection against rough weather conditions (snow storm, dust, etc.);
- it can become a road-block to the traffic in case of storms when the plantation can be torn.

In order to avoid these impediments, new solutions for the plantations' realization have been studied and designed, the plantations being placed in groups along the road at distances of approx. 500m alternately, on the right and left side of the road in the traffic direction.

In addition, it has been studied the realization of plantation shelter belts in the areas considered to be predisposed to snows or wind actions, the belts being composed by rows of scrubs or short-sized plantation in order not to endanger human lives in case of traffic accidents.

#### **MATERIAL AND METHODS**

Plantations are executed in order to perform a set of services, mainly those regarding the improvement of traffic conditions, alignment aesthetics and environment protection, being necessary that they meet the following demands:

- to be framed in the surrounding landscape and to improve the road's aesthetic aspect, avoiding, thus, monotony;
- to contribute at the traffic safety by increasing the visual guide effects, especially during winter and on fog, performing also the function of shock absorption and of vehicles' retention, in case they accidentally leave the road;
- to mask the unpleasant aspects and the degraded surfaces near the road;
- to highlight the tourist objectives, art works, service spaces, parking places etc.;
- to assure the protection of eroded slopes;
- to retain the snow, the sand and the dust carried away by the wind, preventing, thus, their settling down on the road platform and to stem the eventual snow breaks;
- to realize a favourable microclimate.

This protection measure will be applied in situations when the snow screens drift at the first snow storm.

Plantation shelter belts can be:

- under the shape of continuous stripes of trees and scrubs, set in several rows;
- in isolated rows of trees and scrubs with intervals in between.

The planting layout will be designed by specialists in the area and then approved by the staff administering the roads.

The forester shelter belts defend surely and permanently the road from snow-drifts and will be executed as many times as the soil necessary for their being permits.

When setting up new forester shelter belts, the technical conditions established by the instruction regarding road plantations, the standards and other normative terms in force will be taken into account.

The species composing the shelter belts contain the following:

- the first row from the wind side will be formed by short-sized scrubs or by cut hedge;
- the second row by tall scrubs;
- the third row by tree species size II, starting with row IV by tall-sized species.

There will be no scrubs planted in the interior rows of the shelter belt because they are destroyed by the snow deposit formed during winter or they wither due to the deep shadow cast by the crown of the trees belonging to the superior floors.

The chosen species will be the ones that run up quickly, that have a strong and profound radicular system, a leaf canopy resistant to strong winds, pest attacks and correspondent to soil and climate conditions. When choosing the species, a detailed analysis will be done, knowing that the errors can be very difficult to rectify and only after many years.

The regeneration works for the plantation shelter belt will be executed with the approval of the staff administering the road. Until they start functioning, the young shelter belts will be doubled by a row of screens installed towards the field, at a distance of at least 25m from the plantation border, so that the snow collected does not destroy the young saplings.

The plantation shelter belts already functioning, which have been cut due to the damages caused by snow, hoarfrost, ice, fog and some species' degradations, will be doubled in the first year after the cut with a row of snow screens, installed towards the field at a distance of 25-40m from the plantation border.

The plantation shelter belts will be maintained and completed permanently with corresponding seeding material so that they can function normally.

The protection belts against snow-drifts will be executed by systematic planting of different trees and scrubs, placed in such a way that, by the resistance they opposed to the wind, they reduce its speed and make the snow settle inside and in front of the shelter belt.

In order to design the protection belts, it must be established, based on several years' studies and observations, the direction, intensity and frequency of the wind that snow-drifts the road, and also the quantity of the snow deposited on the road platform.

According to the wind direction, the orientation of the protection belt will be established, and, according to the wind intensity and snow quantity, it will be established the number of rows constituting the protection belt, its width and composition, and the distance of the protection belt from the border of the road platform.

Table 1 presents the distance of the belt placement, in the case of protection belts, the number of rows and the distance between them, according to the possible quantities of snow deposits on the roads.

Table 1

Thickness of snow layer (cm)	Distance from the platform border till the belt's first row (m)	Distance of the belt placement				
		First belt		Distance from the last row of the first belt till the first row of the second belt (m)	Second belt	
		Row no.	Distance between rows (m)		Row no.	Distance between rows (m)
25	20,0...25,0	2	2,5	-	-	-
50	30,0	4	2,5	-	-	-
75	40,0	6	2,5	-	-	-
100	50,0	6	2,5	-	-	-
150	40,0	6	2,5	30,0	4	2,5
200	50,0	6	2,5	35,0	6	2,5

In the cases when the direction of the dominant wind provoking the snow-drift is oblique on the road axis, the distances mentioned in columns 2 and 5 in Table 1 will be multiplied by the sine of the angle formed by the wind direction with the road axis.

When placing plantations on the road safety areas, in the case of heavy snow sectors, species with pyramidal shape crowns will be chosen. The tree trunks will be kept without branches on a height of at least 4.5m above the level of the road platform.

On the side of the road where the wind frequently produces snow-drifts, there will not be planted species with spherical crown, oval with pendent branches or scrubs. In parking places, bus stations, traffic islands, there will be planted, instead of scrubs, flowers or other tumble-weeds, which will be cut in autumn. When planting, the saplings will have their trunks

lopped of branches on a height of at least 2m from the base of the trunks. In the case of the species with large or low crown, the lopping will be done to raise the crown in order to reach, at the border of the road platform, at least 4.5m headroom from the level of the road platform. The trees which snow-drift the road with their crown and on which no lopping can be done will be dig out and replaced by tall-sized saplings.

Poplar and other species of big dimensions whose trunks snow-drift the road will be exploited and replaced by a young plantation.

The suckers, sprouts and other tree saplings, scrubs and weeds, which appear naturally on the road territory, will be cut.

The plantations realized on the roads will be executed according to the technical norms in force, correlated with the local situations resulted as a consequence of the observations referring to the snow on the respective road sectors.

The plantations realized within the arrangements related to the road are landscape combinations of trees, scrubs, sward and executed flowers:

- on median lanes of the motorway;
- in parking places;
- on traffic islands from road junctions;
- around fountains and springs.

Plantations on motorways median lanes are executed with scrubs species having elastic stem which, by their leaf canopy can make vegetal screens which stop the drivers' blinding effect produced by the lights of the vehicles circulating from the opposite direction.

The dimension of the vegetal screen must be realized by cutting the scrubs during the vegetative pause, so that at the edge of the carriageway remains a visibility space  $S=0.50 \dots 1.00\text{m}$ . and an height  $h$  of 1.40 - 1.60m.

The vegetal soil of the median lane must have a concave shape in order to avoid the drainage of the waters from the median area towards the carriageway.

The plantation layouts of the scrubs are established according to the width of the median lane, the width of the directional guardrails and the degree of the motorway's snow-drift, as follows:

- scrub plantations, on one row, situated on the axis of the median lane, at the distance  $d=0.75-2.00\text{m}$  between the scrubs;
- scrub plantations, on two rows, placed symmetrically from the axis of the median lane, in criss-cross (in shape of chess board) at the distance between the scrubs of the same row of  $d=2.00\text{m}$ ;
- in the case when gutters are placed in the axis of the median lane in order to direct waters, the plantation is made on two rows placed in criss-cross (in shape of chess board) at the distance of  $d=2.00\text{m}$ , in groups at the distance  $d=1.00\text{m}$  between the scrubs of the same row, or as a hedge alternating with isolated scrubs;
- when the direction of the dominant wind does not produce the snow-drift of the motorway, plantations are executed on the median lane in the shape of hedge placed in an angle of 45 degrees from the axis of the median lane.

Plantations in parking places are executed at a minimum distance of 1.50m from the exterior edge of the kerb that frames the parking area, and they are composed by tree and scrub species, annual and perennial plants and also sward.

At the entry and exits points of the parking places, trees with spherical crown are usually planted, at a minimum distance of 2.25m from the border of the road platform as far as

it does not obstruct the visibility.

In the parking places situated on the road sectors exposed to snow-drift, species of trees having a pyramidal shape are planted at a distance of 10m one from the other, completed by small scrubs and perennial annual plants.

In the parking places situated under the open-wire electrical lines and telephonic ones, trees size III or scrubs are planted, and at those with underground pipes and cables, only scrubs are planted.

Around the parking places situated in forestry areas, having the wood side at a distance under 10m from the border of the road platform, no plantations are executed.

Plantations in the traffic islands from the ground level road junctions are executed by scrubs, small scrubs and flowers, having the height up to 0.50m.

At the exterior of the junction, trees and scrubs are planted.

Plantations around fountains and springs in the road area are executed by trees and scrubs, at distances of minimum 1.50m from the kerb of the arranged sector around the fountain and spring.

### **RESULTS AND DISCUSSIONS**

The planting of the protection belts against snow-drifts is done on the base of feasibility studies and execution projects. The necessity of planting the protection belts will be established according to the criteria of economic efficiency of the snow screens placement solution, taking into account, on one side, the period of traffic interruption during winter, the cost of clearing the snow, and, on the other side, the cost of the terrain, the plantation and maintenance works, the exploitation of wood substance.

Plantations have also the role of reducing noises and of retaining the gases produced by vehicles. In addition, the plantations, by their settings, must not increase the accidents' gravity in the cases in which the vehicles might leave the road, not cause snow-drift on the road, they must not mask the art works but highlight them as architectural value and as settlement, by a well-balanced use of trees, scrubs or some climbers.

While realizing plantations on the roads, the aim is especially to assure a harmony between their totality and the surrounding landscape. The type of plantations, as far as essences, dimensions and colours are concerned, is chosen according to the landscape characteristic to the environment crossed by the road's alignment. In this sense, it is necessary to provide the plantation with a progressive passing from the road platform to the natural framework. Hereby, for example, if the crossed section is rich in tall trees, the road being in deep cut, this passing on the roads' slopes will be done starting from the shoulders planted with tumble-weeds or flowers, which assure, among others, also an effective visual guide, and continuing with scrubs plantations that make the move from tumble-weed to the existing tall trees.

### **CONCLUSIONS**

Apart from retaining the snow, the sand and the dust carried away by the wind, preventing, thus, their settling down on the road platform, the plantations must contribute to traffic safety by raising the visual guide effects, especially during winter and on fog, performing also the function of shock absorption and of vehicles' retention, in case they accidentally leave the road.

The paper proposes this manner of positioning the plantation after having attentively analyzed the traffic accidents caused by the existing plantations and after having counted the sectors predisposed to snow-drift and calculated the cost of maintaining the roads' stability in these situations.

**BIBLIOGRAFY**

1. MALIȚA IOAN - Noțiuni de proiectare și încadrarea drumului în mediu, Editura Mirton, Timișoara 2007
2. MALIȚA IOAN - Tehnologia lucrărilor de drumuri, Editura Mirton, Timișoara 2007