

# The Effect of Crash Barrier on the Snow Deposits of Highways

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# 1. INTRODUCTION

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- The modern highways have several rows of crash barriers.
- In the winter, this leads to the fact that all roads embankment which are not protected from snow blizzards with forests, are blocked by snow.
- Two possible variants of crash barriers works during blizzards were identified.
- The variants depend on the scheme of snow removal next to the barrier.



## 2. SNOW DEPOSITS ON THE ROAD SURFACE WHILE COMPLETE REMOVING OF CRASH BARRIER FROM SNOW

The effect of the crash barrier on the snow deposits includes:

- The wind speed in the area of blowing out snow through the crash barrier exceeds the field wind speed by 30-50%;
- The minimum speed of windsnow flow is achieved at a distance of about  $5H$  ( $H$  – the height of the crash barriers), where the first snow deposits occur and snow drifts begin to form.

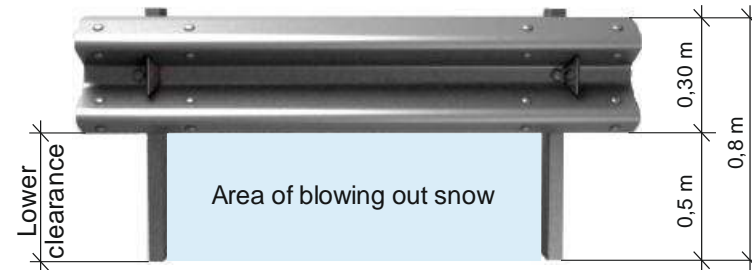


Figure 1 – The standard crash barrier

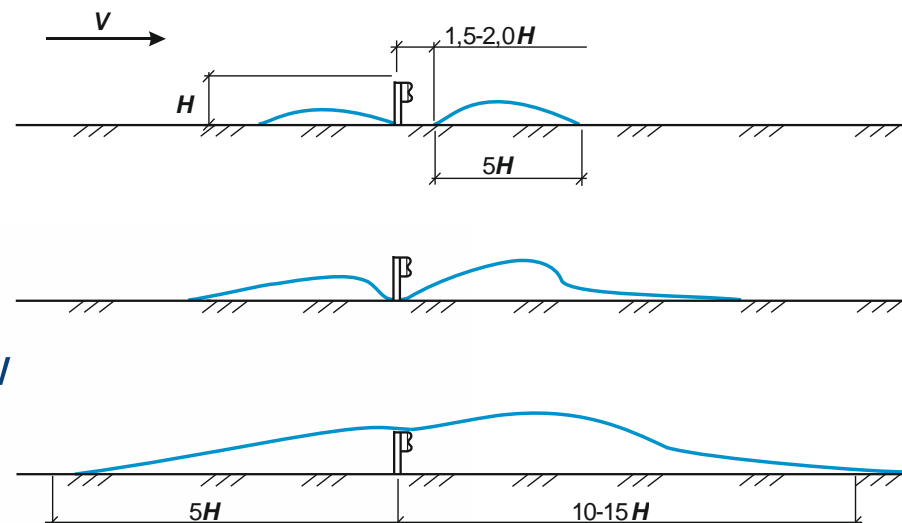


Figure 2 – Consistency and form of snow deposits for the blow-snow barriers with light transmission 0,6





### 3. SNOW DEPOSITS ON THE ROAD SURFACE WITH SNOW UNDER CRASH BARRIERS

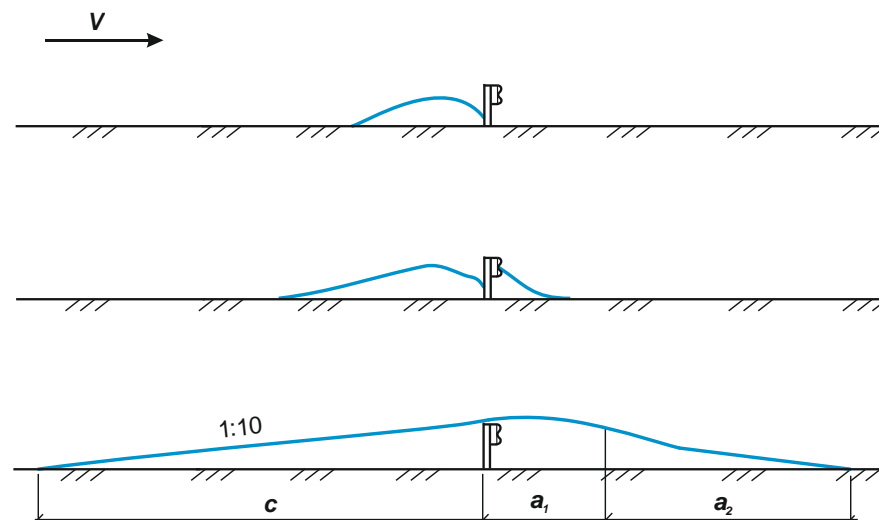


Figure 4 – Consistency and form of snow deposits at entire barriers

Table 1 – The length of the leeward zone of snowdrifts behind entire barriers

Wind speed, m/c	$a_1$ , m	$a_2$ , m	$c$ , m	The length of the leeward zone of snowdrifts ( $a_1+a_2$ ), m
5	$H = 0,8$	$5H = 4,0$	$10H = 8,0$	4,8
10	$2H = 1,6$	$8H = 6,4$	$10H = 8,0$	8,0
15	$3H = 2,4$	$12H = 9,6$	$10H = 8,0$	12,0
20	$4H = 3,2$	$18H = 14,4$	$10H = 8,0$	17,6
25	$5H = 4,0$	$26H = 20,8$	$10H = 8,0$	24,8

### 3. SNOW DEPOSITS ON THE ROAD SURFACE WITH SNOW UNDER CRASH BARRIERS

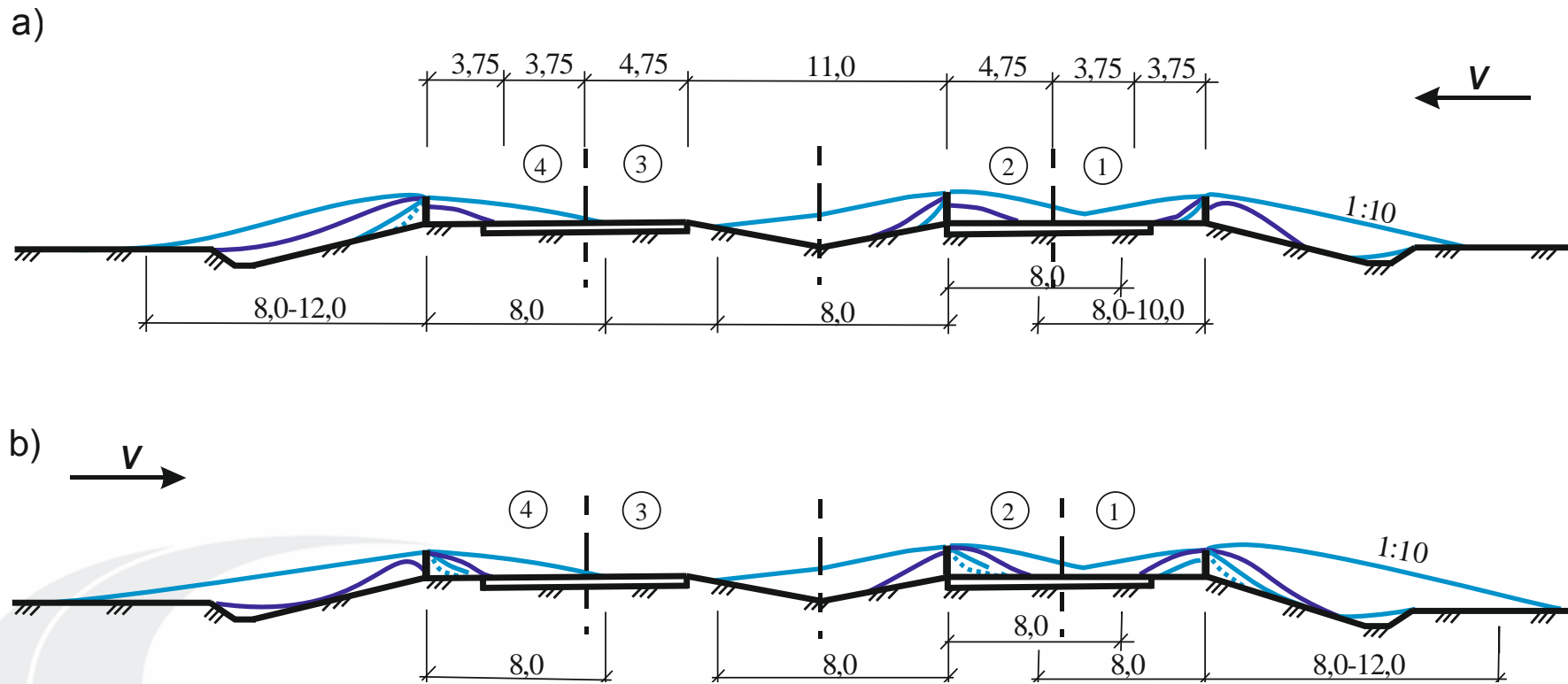


Figure 5 – Schemes of snowdrifts on the road surface next to crash barriers filled with snow with a different direction of windsnow flow: a) with wind direction on the right of the road; b) with wind direction on the left of the road; 1, 2, 3, 4 are numbers of traffic lanes;



## 4. THE OBSERVATIONS ON EXPERIMENTAL SECTIONS OF THE ROAD

### Characteristics of the federal highway M-4 "Don on the site Moscow – Voronezh

The name of parameter	The characteristic of parameter
Road category	I B
Length, km	536
Number of traffic lanes	4
Subgrade width, m	27,5
Road surface width, m	7,5 x 2
Shoulder width, m	3,75
Dividing lane width, m	5÷11,0



Figure 6 – The scheme of the federal highway M-4 "Don" on the site Moscow - Voronezh with indication of complex stations placement

## 4. THE OBSERVATIONS ON EXPERIMENTAL SECTIONS OF THE ROAD

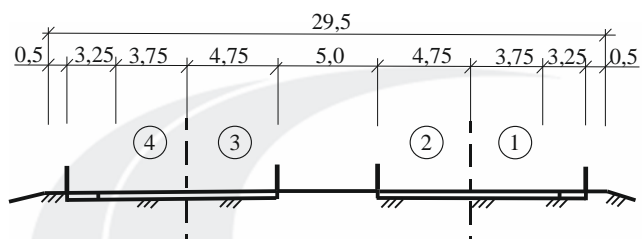
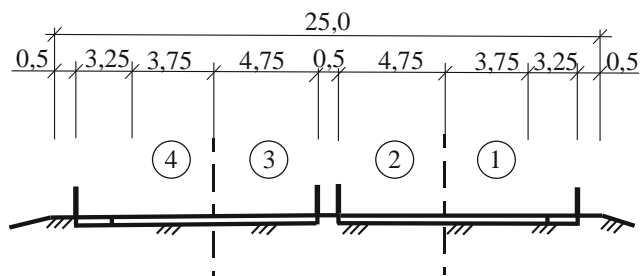


Figure 7 – Variants of crash barriers placement on experimental sites

## 4. THE OBSERVATIONS ON EXPERIMENTAL SECTIONS OF THE ROAD

The process of snow accumulation on the road experimental section during blizzard



## 5. THE DETERMINATION OF THE SNOW DEPOSITS AMOUNT ON THE ROAD SURFACE

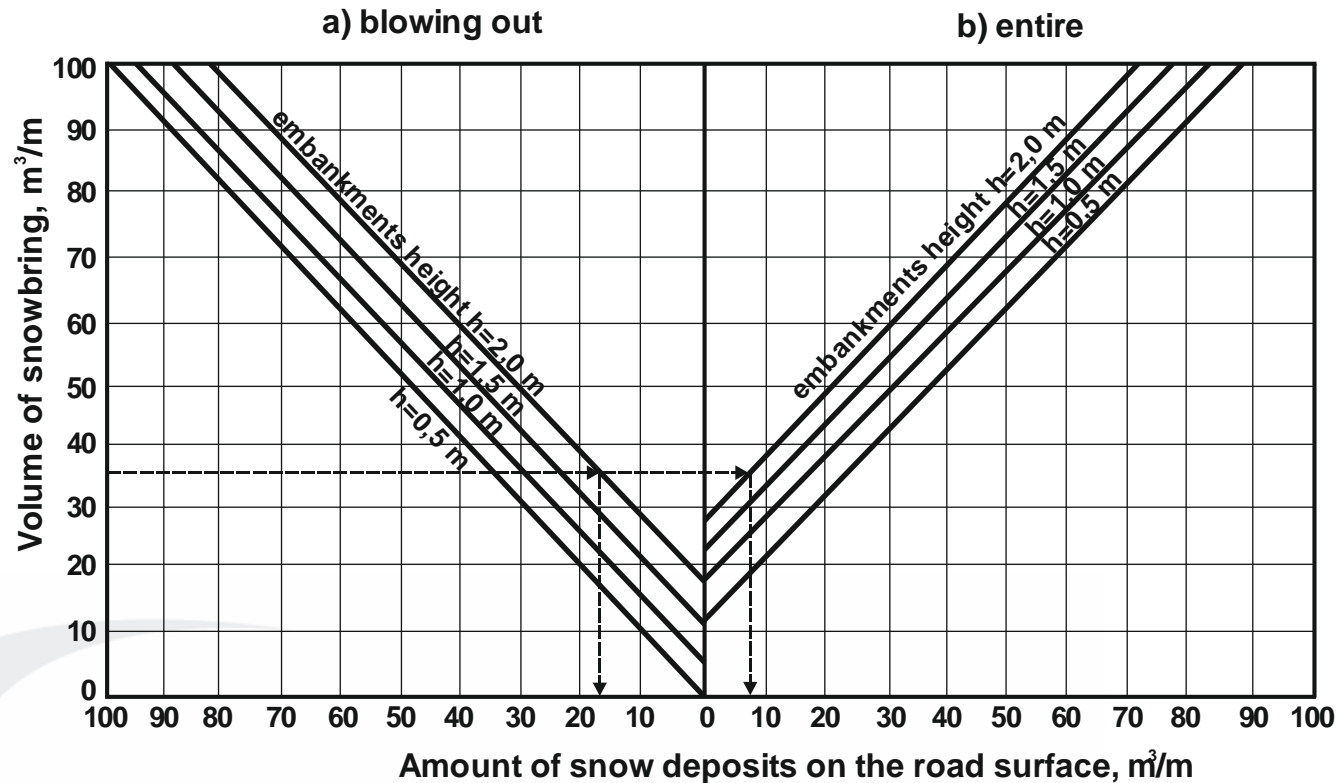


Figure 8 – The nomogram for predicting the snow volume which will deposit on the road surface with width of 35,5 m at the known snowbring volume: a) the crash barrier works as blow-snow fence; b) the crash barrier works as entire, snow accumulation fence

## 6. CONCLUSION

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1. Crash barriers can work as blow-snow fence or as entire, snow accumulation fence.
2. Crash barriers work as blow-snow fence in the beginning of blizzard until snow removal starts or all winter if the full cleaning of barriers from snow is constantly made.
3. Crash barriers begin to work as entire snow accumulation fence after the first snow removal when the snow fills the lower open part of barriers.
4. The availability and placement scheme of the crash barriers on the highways should be considered when planning the snow removal.

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Thank you for your attention!