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Студенттер мен жас ғалымдардың
«ҒЫЛЫМ ЖӘНЕ БІЛІМ - 2018»
XIII Халықаралық ғылыми конференциясы

СБОРНИК МАТЕРИАЛОВ

XIII Международная научная конференция
студентов и молодых ученых
«НАУКА И ОБРАЗОВАНИЕ - 2018»

The XIII International Scientific Conference
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«SCIENCE AND EDUCATION - 2018»

12th April 2018, Astana

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Л.Н. ГУМИЛЕВ АТЫНДАҒЫ ЕУРАЗИЯ ҰЛТТЫҚ УНИВЕРСИТЕТІ

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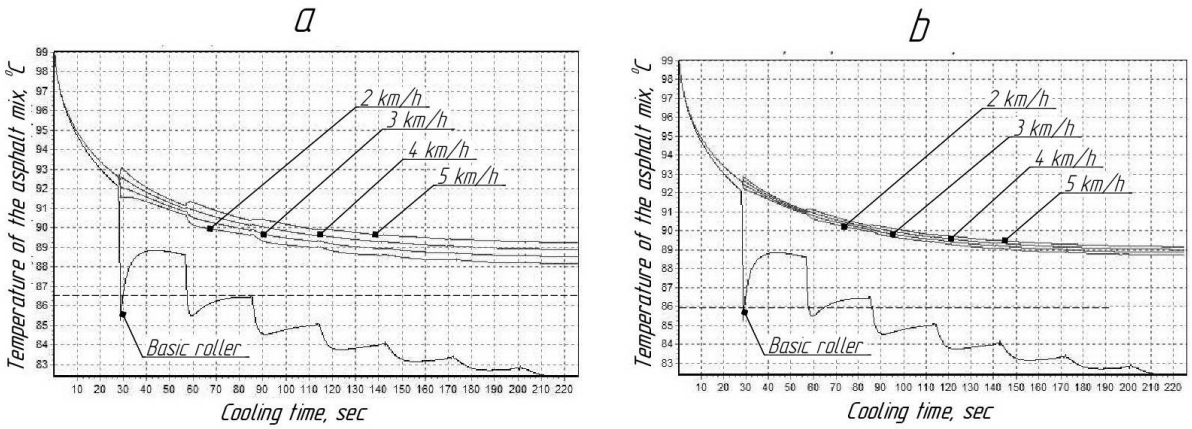

Figure 5. The intensity of cooling of asphalt concrete mix with a thickness of 11 cm at the contact of the drum with a constant temperature: a) 70^0C; and b) 100^0C

Analyzing the dependences obtained (Fig. 2 - 5), it can be concluded that the compaction of asphalt mix with a greater layer thickness the intensity of the cooling is reduced. In addition, with increasing temperature the intensity of the cylinder cooling is reduced, allowing a greater number of passes of the rink on the same track until, until the temperature of the mixture does not decrease below the critical value (85 ^{0}C). Thus, there is the possibility of achieving higher values of compaction factor of the asphalt mixture. This acquires special relevance in the construction of asphalt pavement in adverse conditions of the autumn-summer period.

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FREEZING INFLUENCE TO SUSTAINABILITY OF THE CONSTRUCTION

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1 INTRODUCTION

Soil ground can be significantly influenced to the integrity of foundation in the seasonal freezing climate of Kazakhstan. The soil specimens obtained from construction site are used for subgrade in the construction. The proper determination magnitude of frost heave and heaving pressure by the influence of the cold freezing temperature during the winter season are necessary for design and construction. The experimental tests are conducted for the specimens obtained from Astana (Kazakhstan) to determine the freezing pressure and the magnitude of frost heaving.

2 SOIL GROUND PROPERTIES AND FREEZING EXPERIMENTS

2.1 Soil properties and test methods

It is important to know soil ground properties for defining freezing susceptibility, which is important for design and construction of the buildings. Frost susceptibility could be estimated roughly by freezing soil normatives according to soil properties.

The special mold which can eliminate the side friction between soil and wall is used in the laboratory freezing test of soils. Prior to the laboratory freezing test, geotechnical properties of the soils are determined throw the basic geotechnical tests [1,2,3]. The geotechnical properties of soil specimens are presented in Table 1.

Table 1. Properties of the soil specimens

Soil number Description	I CL	II SP	III SM	IV CL
Specific gravity (G_s kN/m^3)	2.62	2,63	2,67	2.63
Natural water content (w_n,%)	21	N.P	N.P	27
Particle size passed #200 (%)	52	19,6	1,9	86.1
Liquid limit (LL, %)	27.01	N.P	N.P	42
Plastic limit (PL, %)	17.75	N.P	N.P	25
Maximum dry unit weight (γ_{dmax}, kN/m^3)	1.79	1,92	1,93	1.76
Optimum water content (w_{opt} , %)	15.9	11,5	12,4	18
USCS	CL	SP	SM	CL

The specimen is remolded and prepared in mold which is appropriate for freezing chamber. Only after saturation process, they are putted into the freezing apparatus.

General view of freezing chamber filled in with soil and freezing equipment is presented in Figure 1.

Fig. 1. Freezing camera

The grain size distribution curves of the soils are presented in Figure 2. The first 24 hours is a conditioning period. Both the top and bottom plates are kept on the temperature at 3 ^{0}C. The first freeze starts at the beginning of the second 24-hours period. The temperature of the top plate was lowered and hold it up at -3 ^{0}C. The temperature of the bottom plate was kept at 3 ^{0}C for 8 hours. Grain-size distribution curve is presented below.

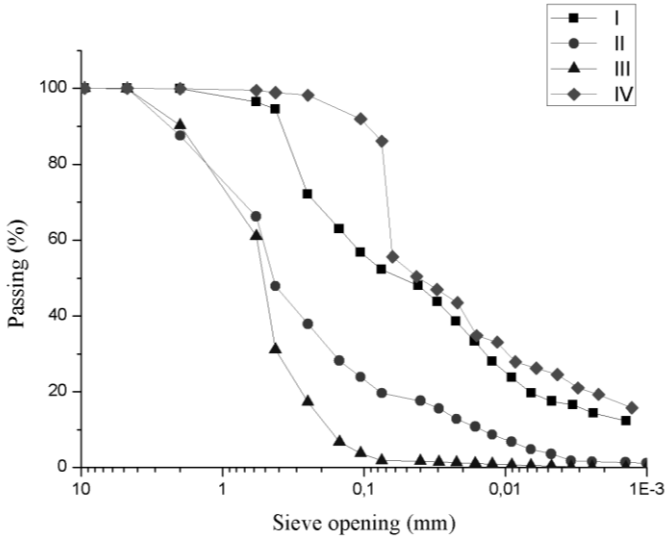

Fig. 2 Grain size distribution curves of soil specimens

2.2 Experimental freezing test results and discussions

The experimental freezing tests were performed for understanding frost susceptibility of the soil and predetermination of possible frost action to the structure[4,5]. The frost heaving results of soil specimens after freezing test are presented in Figure 3. There are different curves which show frost heaving results by freezing test.

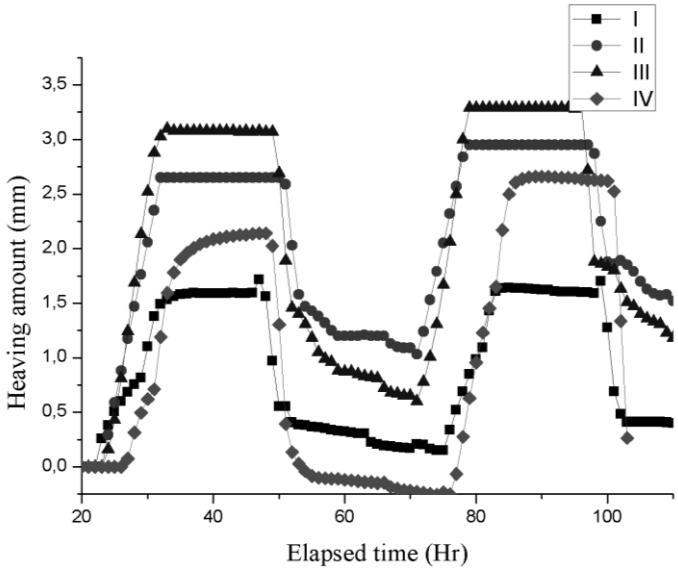

Fig. 3 The frost heaving amount of the soil specimens by ASTM

Also freezing test according ASTM is compared with TRRL testing provided by experiments throw freezing chamber. The results show differences because of the variable methods and pasted below in Figure 4.

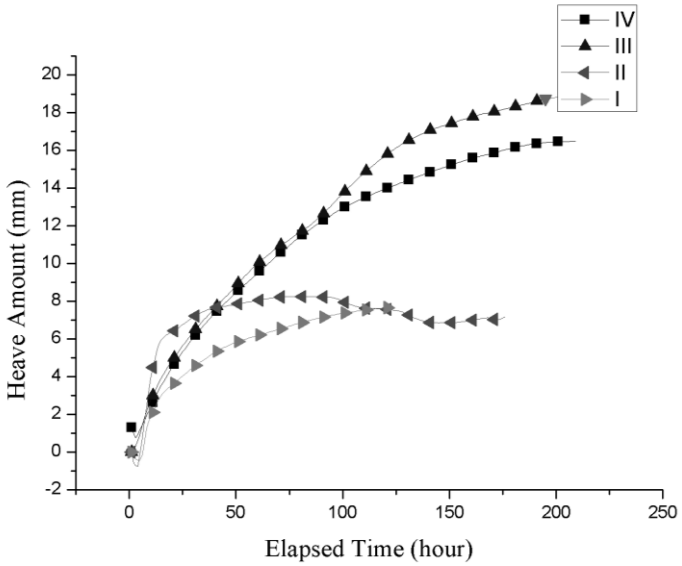

Fig. 4 The frost heaving amount of soil specimens by TRRL

There also presented results of frost heaving pressure below.

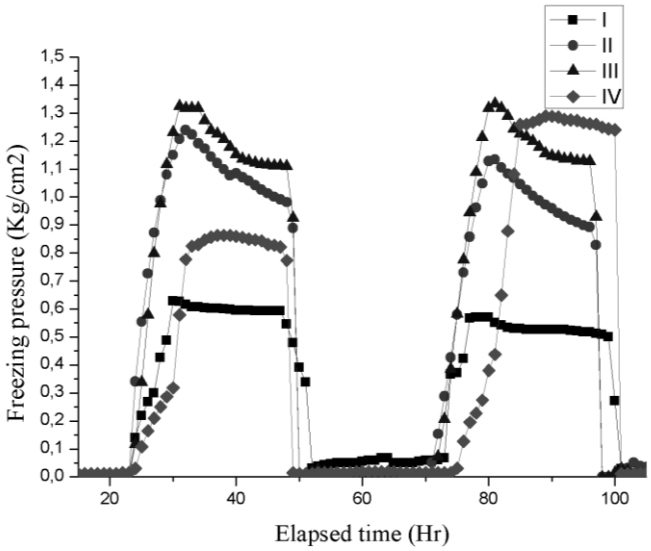

Fig. 5 The freezing pressure curves of soil specimens by ASTM

The freezing pressure, heaving amount of soil specimens gives different results which show frost susceptibility of the soil specimens. According to the results TRRL frost susceptibility properties like frost heaving could reach more than 18 mm and heaving pressure 400 kPa. These results could damage roads and other light-weight constructions.

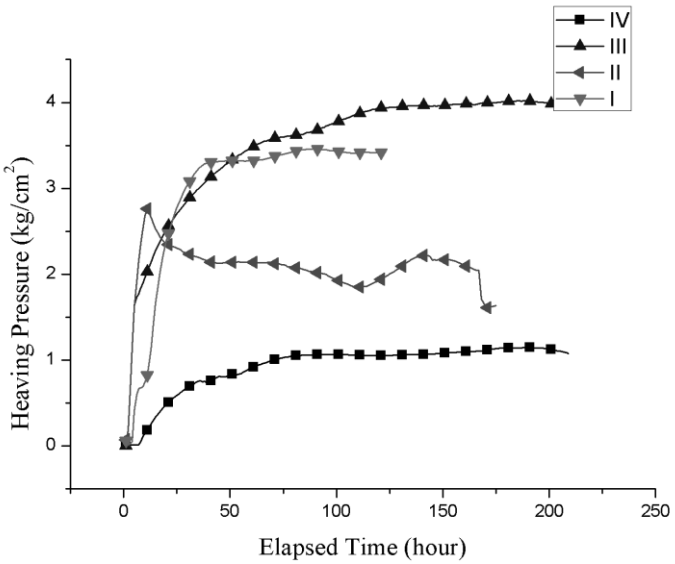

Fig. 6 The freezing pressure curves of soil specimens according TRRL

CONCLUSIONS

The results of the freezing tests by ASTM (American Standard) and TRRL (British Standard) shows high frost susceptibility of silty-clay soils, which could be very harmful in construction foundations, Also maximum results of heaving pressure mark 400 kPa, which is should be include in design project of buildings and structures. The maximum heaving amount is about 20 mm, which is also big threat to construction and extra-measures should be include in design documentation for prevention deformations in soil ground with foundations.

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