A RESEARCH PAPER ON USE OF COMMON SALT TO REDUCE EFFECT OF FREEZING AND THAWING ON SOIL

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Abstract: Extreme freeze-thaw action occurs on the soil due to temperature changes. This action causes damage to the surface soil structure. In this research, two soil sample were taken. Salt was added to one of the soil sample. freezing–thawing process of the soil samples collected was carried out by laboratory experiments to determinate the volume variation of soil as well as shear strength, after the soil experiences various freeze–thaw cycles. The direct shear test was performed on both the soil sample in the laboratory.
Results show that cohesion and shear strength decreased as the volume and porosity of the soil increased after experiencing various freeze–thaw cycles .
But the soil added with the salt had comparatively less decrease in the shear strength of the soil.
Results of test was noted down. The structural damage among soil particles due to frozen water expansion was the major cause of changes in soil
KEYWORDS: Sodium chloride, freezing and thawing, shear strength, soil.

I. INRODUCTION

In those parts of the world which experience freezing temperature, problems arises because the soils expands on freezing and exerts the force on the structures in contact with thenm. Thawing (due to melting ice)results in the Loss of strength in the soil. Structures resting on these surfaces will perform satisfactorily only if measures are taken to withstand the effect of freezing and thawing. More than 20 million tons of salt are used every year to melt snow and ice in cold northern regions. But how does salt do it? First, it's important to understand a bit about H2O in the winter. Thirty-two degrees Fahrenheit (0 degrees Celsius) is its freezing point—that is, when water reaches 32 °F, it turns into ice. At this temperature, your icy road generally has a thin layer of water on top of the ice, and the ice molecules and water molecules are interacting. This water is constantly melting some of the ice, while the ice beneath it is freezing some of the water. At this temperature, the exchange rate is pretty constant, meaning the amount of water and the amount of ice stay the same. If it gets colder, more water becomes ice. If it gets warmer, more ice becomes water. When the ionic compound salt is added to the equation, it lowers the freezing point of the water, which means the ice on the ground can't freeze that layer of water at 32 °F anymore. The water, however, can still melt the ice at that temperature, which results in less ice on the roads. More than 20 million tons of salt are used every year to melt snow and ice in cold northern regions. But how does salt do it? First, it's important to understand a bit about H2O in the winter. Thirty-two degrees Fahrenheit (0 degrees Celsius) is its freezing point—that is, when water reaches 32 °F, it turns into ice. At this temperature, your icy road generally has a thin layer of water on top of the ice, and the ice molecules and water molecules are interacting. This water is constantly melting some of the ice, while the ice beneath it is freezing some of the water. At this temperature, the exchange rate is pretty constant, meaning the amount of water and the amount of ice stay the same. If it gets colder, more water becomes ice. If it gets warmer, more ice becomes water. When the ionic compound salt is added to the equation, it lowers the freezing point of the water, which means the ice on the ground can't freeze that layer of water at 32 °F anymore. The water, however, can still melt the ice at that temperature, which results in less ice on the roads. Freeze–thaw action refers to the freezing and thawing of water within a certain range in permafrost caused by daily, seasonal, and multi-annual variations of surface temperature in a specific climatic zone. This action occurs mostly in cold regions at high latitudes and altitudes, and may occur a surface temperatures fluctuate above and below zero degrees Celsius. The volume of water expands as it freezes in the soil , thereby exerting large pressure on the pore walls in soils and rocks and altering physical and mechanical properties of those soils and rocks.

II. TEST EQUIPMENT AND RESULTS

Screw driver test

After various freeze thaw cycles , the soil was tested for compaction. A Screw Driver was penetrated into the soil and the depth till which the soil allowed the penetration was noted.

Weight of hammer = 0.5kg
Height of fall = 20 cm
Height of mould = 9 cm
Diameter of mould = 8.5 cm
No. of layers = 3
No. of temp = 25

SOIL SAMPLE	DEPTH UPTO WHICH THE SCREW DRIVER WAS PENETRATED
SOIL WITHOUT SALT	2.1 cm
SOIL WITH SALT	2.6 cm

III. CONCLUSION

The soil with salt showed the decreased compaction, whereas, the soil without salt showed more compaction and hence had lesser density.

