Civil Engineer for a Day

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Introduction

Interested in the built environment or infrastructure projects? This session will take you through the process of a typical land preparation task from a civil engineering perspective. As a Civil Engineer, you get involved in the design, build, and development of sustainable buildings such as skyscrapers, hospitals, offices, and schools, also, Infrastructure projects such as transportation networks, bridges, roads, railways, airports, water networks and power supply stations.

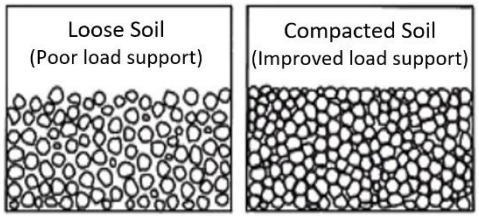
Background

Today you will perform an activity with help of simple ingredients available in your kitchen to understand the process of densification of soil, which in Civil engineering terminology is known as "Soil Compaction".

Soil Compaction is a mechanical process of bringing soil particle closer to each other which resulted in an increase in density of soil by removal of entrapped air between soil particles. It increases the bearing capacity of soil when compacted in its natural state or loose state. It also increases the shear strength of soils a phenomenon responsible to protect soil sliding during earthquake or land sliding. Thus, in short soil compaction, provides a stable soil ready to withstand the loads of foundations of buildings, roads, airport, bridges, and dams.

The Task

The activity can be completed using simple ingredients available in most kitchens to understand the process of densification of soil, which in Civil engineering terminology is known as "Soil Compaction".



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Suggested supplies:

To complete this task, you will need to emulate soil particle size distribution at home, the following are some suggested supplies that are likely to be available in most household kitchens, however, feel free to use your imagination to substitute some of them and do not worry if you are missing some, after all, soil composition varies based on location!

- Kidney Beans and dry chickpeas. Access to around 500 grams each
- Any type of pulses available, for example green gram or yellow split pulses or any other lentil. 500 grams.
- Flour and sugar. Access to around 500grams each.
- Serving plates and serving spoons, three each.

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- A large mixing bowl (plastic or metal). Cotton duster cloth or kitchen towels. (Two)
- Medium size plastic containers with lids, preferable to be transparent (Four).
- A kitchen weighing scale, that can weigh 500gm to 1kg (optional, if you do not have one, you can use a paper cup or plastic cup for measuring dry chickpeas/kidney beans/lintels/flour and sugar quantities.
- A smooth surface, like a dining table (don't use glass top table) or kitchen top for tapping plastic containers.

Procedure:

1. Pour 3-4 serving spoons of kidney beans, dry chickpeas, and any lentil in 3 separate containers.
2. Close the lid of the plastic container and tap 5 times on a kitchen top or any smooth surface, gently using your hand. What do you observe?
3. Now tap the same plastic containers 10 times with a small force, producing a knocking sound. What do you observe? Why are you asked to tap with some force?
4. Now tap the same plastic containers 20 times with more force producing a knocking/bashing sound. What do you observe?
5. Now empty all plastic containers and clean thoroughly with a cotton duster or kitchen towel.
6. Place 500gm of chickpea/kidney/green lintel +250gm of flour in a serving dish separately. Mix well and transfer the mix into plastic plates before securely placing in separate plastic containers. Now properly close the container lid and repeat steps 2- 4.
7. You can repeat step 6 with increasing the amount of flour to 350gms and 500gm.
8. Report your observation. Report separately for each performed steps 2-4. Why has this happened?
9. You can repeat the above processes as explained in steps 1-6, using sugar instead of flour. What do you observe? Report your observation with an explanation.
10. You can also redo step 6 by mixing all ingredients (lintel+ chickpea+ kidney beans) together, add flour or sugar, and tap with some force to produce a knocking or banging sound. Report your observation.

Alternative approach: Rather than tapping the container, can you use an object to tap the container's content? How will this affect the process?

Think about: What do you learn from this, as a Civil Engineer report on the following:

- Why were you asked to select chickpeas/kidney beans/lentil? How can you relate lintel or chickpea or kidney beans with soil particles?
- What would happen when you have added sugar or flour?
- What is the outcome of this activity? How this activity can be related to soil compaction process?

Health and Safety

Avoid the use of glass or breakable containers and surfaces for this task. If you decide to use an actual soil for the task, ensure the cleanness of the soil and it is being free of sharp and foreign objects, you will need hand protection as well.

Record your participation

After completing the task and posting your work to the Padlet, ensure that you complete this form to record your participation to acquire your Certificate of Participation.

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