FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

Department of Civil Engineering

Design and build a water filtration medium using different types of aggregates

Competition Day, 4 August 2017

1. Assignment

Civil engineering is one of the most challenging but exciting careers that one can pursue. To choose the career in civil engineering, one will be exposed to challenges that include scientific and mathematical problem solving in the fields of transportation engineering, water engineering, structural engineering, etc. The amount of energy used for treating water to acceptable drinking quality is immense. Yet most water used around the household does not need to be at drinking quality. Example of such water is water used for flushing toilets and gardening. To bridge the gap, one can design a wastewater filter that can be used to filter wastewater. The wastewater filter can be used to filter water from bathtubs and kitchen. For this project, learners are required to design a filtration medium structure while using materials which can be found naturally on earth. An example of such a structure is shown in Figure 1.

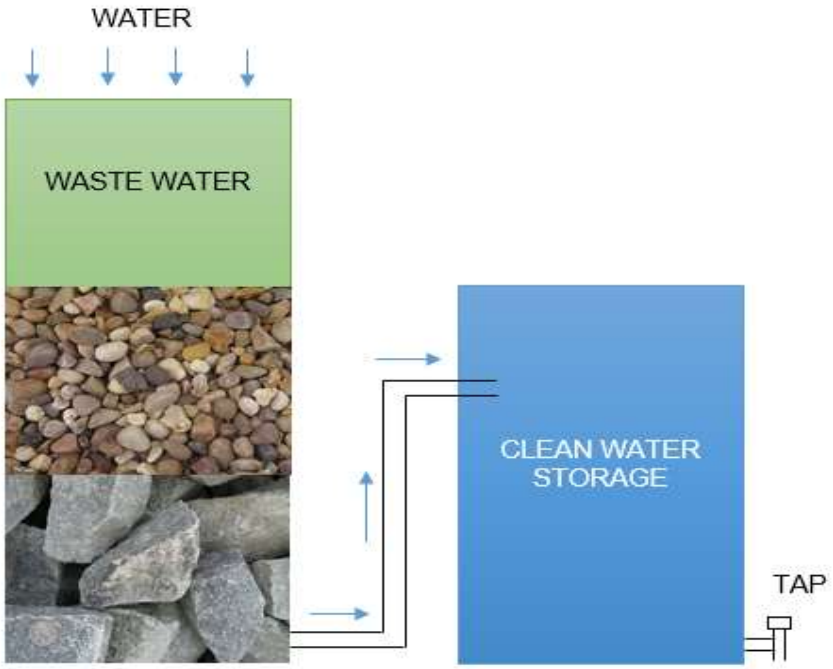

Figure 1

The team which has the best report and design of the medium filtration bed, which produces clear water at faster rate than others, wins the competition.

2. Materials

Teams are allowed to make use of any or all of the following:

- Aggregates/material to be used should be of different sizes and of own choice, e.g. 6mm stone, gravel, river sand.

Report writing

- Print and bind the design report.
- Specify all materials used and dimensions.

3. Rules, specifications and outcomes

- Each team shall bring a finished water-filtering medium and water storage tank to TUT. The medium will not be built at TUT premises.
- Teams consist of a maximum of three learners.
- Schools can enter a maximum of three teams.
- Each team will present a report which contains all the sketches, ideas, calculations, and designs, etc. which were used to decide on the final design of the wastewater filtration medium.
- The design of the wastewater can be circular or rectangle and should be 10 litres (L) total volume.
- Two layers of medium filter should be used, e.g. sand and stone.
- Provision must be made for a pipe that collects water at the bottom of the medium filter and transport it to the clear water tank. The pipe can be of any diameter.
- TUT will provide wastewater that will be filtered through the medium.

4. Learning objectives

- This project will introduce the learner to the fundamentals used in the design of wastewater/water treatment medium filter.
- Learners will be introduced to the fundamentals of pipe flow concept and head losses in pipes.
- Learners will also learn porosity and permeability of different materials.

5. Procedure

All teams must plan and build their projects in advance. If the project is transported to TUT in parts, a maximum of 10 minutes will be allowed to set up your project. The competition officials will show you the place to set up your project.

6. Teams

A team will consist of a maximum of three learners. Points will be given if the team displays a theme, i.e. dressed up.

7. Evaluation

- A team will be disqualified if it becomes apparent to the judges that more than 10 litres (L) was used to construct the medium filter.
- The report will be evaluated on professionalism and neatness by the judges. The judges will use their own knowledge of the compilation of a report to allocate points.(contact Mpho Muloiwa for criteria to judge the report)
- Points will be allocated as follows:
  - 10% - Appearance of the team (is a theme apparent).
  - 10% - Physical design of the wastewater filter.
  - 10% - Professionalism and neatness of the report.
  - 35% - Clearness of the water after filtration through the medium.
  - 35% - For how quickly water filters through the medium and fills the storage tank.
- The team with the highest percentage wins.

Contact details

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