Summary

With the increase of computational power available for companies, researchers, engineers and developers, more sophisticated software is developed for all kind of applications. One of those applications is found in the bulk material handling industry. By development of EDEM© software researchers and engineers are able to simulate bulk materials flows. This allows them to gain better insights on the performance of bulk material handling and process equipment. The EDEM© software can be used as a tool to virtually test, redesign and optimize pieces of equipment.

Scientific research into the performance of EDEM© software however, is sparse. At the M&TT department of the TU Delft, researchers would like to do a study to validate the EDEM© software. To validate this software first data about different types of material has to be generated in a consistent and reproducible way. This data will be used to make a comparison between reality and simulation.

The objective of this design assignment is to design and manufacture an experimental set-up that allows the user to determine several characteristics of bulk materials. The characteristics to be determined are:

- Angle of repose
- Mass flow profile
- Impact of the material

In chapter 2 the design methodology used to obtain a design is presented and briefly explained. Chapter 3 will introduce the conceptual phase. In this phase the required functions for the design are determined, the design criteria are set, different concepts are presented and a conceptual design is chosen. In table 1 the defined function are presented. Table 2 summarizes the set design criteria.

Table 1. Function definition	
A.	Determine the angle of repose of the material
B.	Determine the mass flow of the material
C.	Determine the impact of the material
D.	Have an adjustable outlet opening
E.	Have an adjustable material falling height

Table 2. Design criteria	
1.	Generate reproducible tests
2.	Should be user-friendly
3.	Resemble a realistic setting
4.	Suitable for material with an AoR between 25 and 50 degrees
5.	Suitable for samples of 10 liters
6.	Suitable for particles up to 2 cm.
7.	Suitable for material with a density up to 8000 kg/m^3 (steel)
8.	The ratio between the dynamic and the static volume should exceed 1
9.	The outflow of the materials has to be (close to) uniform

Furthermore chapter 4 introduces the detailed design phase. In this chapter dimensions are determined, structural calculations are done and simulations in *Ansys* and *Adams* are presented. The chapter concludes with the presentation of the final design. The dimensions and final design are presented in figure 1 and 2 respectively.

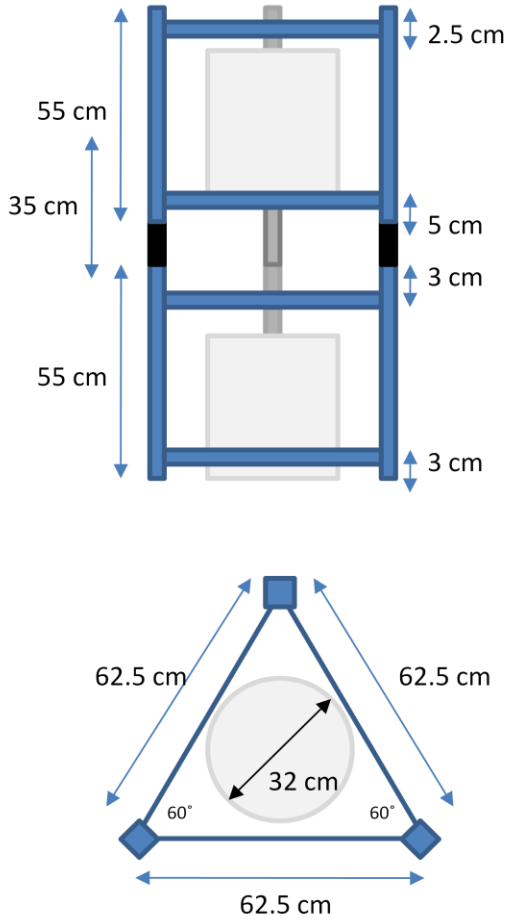

Figure 1 Design dimensions

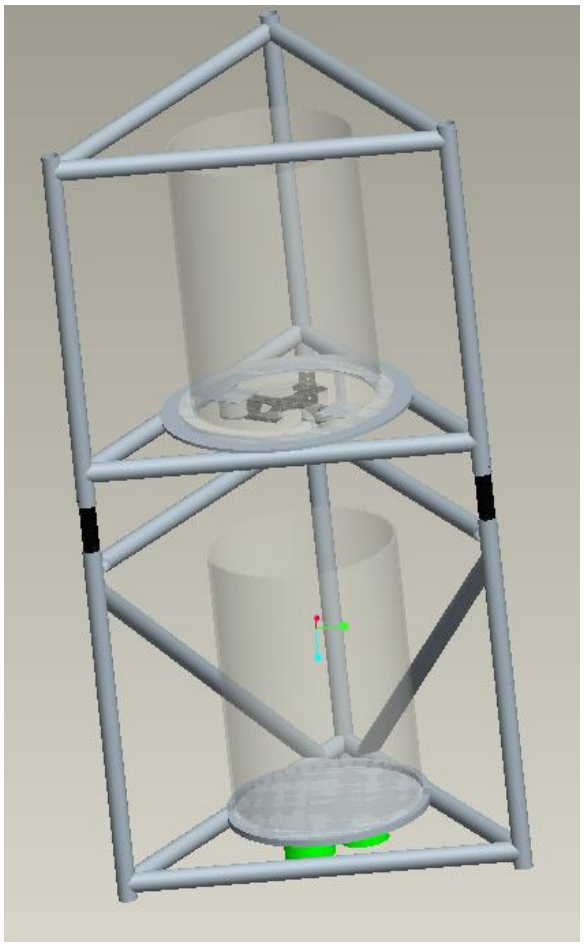

Figure 2 Final design

Chapter 5 describes the production phase where tendering, fabrication and commissioning are discussed.
In chapter 6 several test runs with materials are presented and the design is evaluated. Furthermore several recommendations to improve the use of the set-up are made.
Finally, chapter 7 concludes the report stating that the set-up fulfills all required functionalities, satisfies the design criteria and works properly.