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## Concrete rebound test hammer PCE-HT-225A and calibration block for concrete tester PCE-BPHC 1

### REPORT

#### INTRODUCTION

The concrete rebound test hammer PCE-HT-225A and calibration block for concrete tester PCE-BPHC1 are being used by a group of three year 4 students (14-15 years old) under the supervision of a mentor/teacher. The students are working on a science project to participate in the European Schools Science Symposium 2019 that will take place in Mol (Belgium).

#### **1. About our School**

The European Schools are official educational establishments controlled jointly by the governments of the member states of the European Union. In all these countries they are legally regarded as public institutions.

The mission of the European Schools is to provide a multilingual and multicultural education for nursery, primary and secondary level pupils.

The European School of Frankfurt is a fully comprehensive, non-fee paying establishment comprising approximately 750 students in its secondary division. It is primarily aimed at children of staff of the European institutions in Frankfurt and close towns, these are: European Central Bank (BCE), European Insurance and Occupational Pensions Authority (EIOPA), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the European Space Agency (ESA).



European School of Frankfurt

## 2. The European Schools Science Symposium

The **European Schools Science Symposium** is a competition open to students of all the European Schools (13 official and 20 accredited schools), including years 1 to 7 (11- to 18-year-old students). Individuals or groups of 2 or 3 students, guided by a teacher-mentor, are encouraged to explore an area of scientific interest of their choice, not normally covered by the European Schools' science syllabus.

The projects are showcased during the symposium and judged by teachers and subject experts. Prizes are awarded for the best entries. Juniors and seniors are judged separately.

The overall winning project in the senior category represents the European Schools at the European Union Contest for Young Scientists later in the year.

## 3. The project

One of the junior projects that will participate in the European Schools Science Symposium 2019 (ESSS 2019) is formed by three year 4 students (14-15 years old) who are investigating the use of plastic waste in construction.

Plastic waste is an increasing problem in our modern-day world. Areas of thousands of square kilometres in our oceans are littered with all kinds of plastic which pollute our waters and ultimately end up in our food chain.

The students want to investigate if plastic waste can be used as a substitute for sand in concrete. Global use of sand has increased so much that among other issues, ecosystems are suffering from loss of habitats and some countries are more likely to be flooded. For these

reasons, they came up with the idea of replacing some of the sand in concrete with the plastic we dispose. This would both decrease the amount of sand used and find an application for waste plastic that would otherwise go to landfills.

## **EQUIPMENT USE**

In order to evaluate if waste plastic can be a good replacement for sand in concrete, the students are preparing and comparing 19 different sample bricks constructed out of different ratios of cement, sand, plastic and aggregate. They are comparing 3 different types of plastic: PVC, HTPE and PET plastic to a brick containing only sand. For each type, they are making four bricks replacing 5%, 10%, 30%, 50%, 100% of the sand.



Materials used to make the sample bricks. From left to right: sand, aggregate, cement and plastic



Some of the sample bricks made with different ratios of construction materials

To test the above-mentioned bricks' integrity and strength, the concrete rebound test hammer PCE-HT-225A is being used after calibrating it with the calibration block for concrete tester PCE-BPHC 1.



Student calibrating the concrete rebound test hammer PCE-HT-225A with the calibration block for concrete tester PCE-BPHC 1 at the European School of Frankfurt

Before taking the measurements, the surface of the sample bricks is prepared using the grindstone provided in the carrying case together with the rebound hammer.

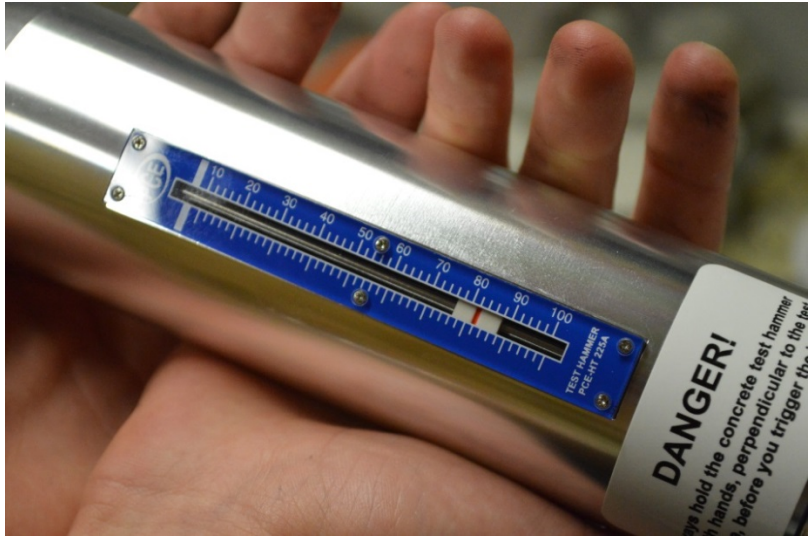


Student preparing the surface of a sample brick for the hardness and compression tests with the rebound test hammer PCE-HT-225A

Local variation in the sample could cause inaccurate readings. Therefore, the measurements of surface hardness and compression strength are being taken in six different spots on the surface of each brick and the average is calculated.



Student making a surface hardness and compression strength test on a sample brick with the rebound test hammer PCE-HT-225A



Reading of the rebound test hammer PCE-HT-225A

## **CONCLUSION**

The concrete rebound test hammer PCE-HT-225A is perfect to take accurate measurements of surface hardness and compression strength of concrete. Its main advantage is that it is easy to use, to read and convert rebound values indicated to  $\text{kg/cm}^2$  and MPa (with introduction of impact angle), using the conversion tables provided in the user manual. Besides, it is also very easy to calibrate with the calibration block for concrete tester PCE-BPHC1. Both devices are very recommendable.