Concrete Strength Analysis: Reduce Coring Costs with Rebound Hammer Testing

Concrete is an essential construction material that is used globally. Combining coring and rebound surveys provides the most efficient and cost-effective method of assessing in situ concrete strength, a critical property for safety and quality control in concrete structures. The new Original Schmidt Live hammer from Proceq uses automation to take the headache out of obtaining rebound numbers and increase efficiency by 90%.

Concrete is the most widely used synthetic material in the world due to its high compressive strength, durability, long life, and fire-resistant properties. Every year, millions of tons of concrete are used in large construction projects including dams, bridges, buildings, and roads.

Monitoring concrete strength is essential for safety and quality control

Structures built with concrete that do not possess sufficient strength can develop cracks or even collapse, which can have catastrophic consequences. Assessing the compressive strength of concrete in finished structures, known as in situ strength, ensures that concrete has cured correctly and possesses the required strength for the final structure to be safe, durable, and meet any required regulations. In situ strength testing can also be used to assess the condition of older concrete structures or those undergoing modifications. Although compressive strength can be measured easily in a laboratory using a compression testing machine, testing the strength of concrete structures in situ can be more challenging.

Coring provides precise measurements of in situ concrete strength

Coring is the most reliable and precise method for testing in situ concrete strength. Coring involves cutting cylinders of concrete from various locations in the structure. The compressive strength of the cores is then tested using a compression testing machine, where compression testing is most widely accepted as the reference method for determining core strength.

While coring provides precise measurements of concrete strength when carried out correctly, the method comes with major drawbacks, in that coring is expensive and limited. Removing too many cores can leave weak points in the concrete structure and damage its performance, so conducting a complete assessment of concrete strength using coring alone is impossible. Consequently, coring is often supported or replaced by non-destructive methods of measuring concrete strength, which can aid efficient coring assessments and reduce costs.
Rebound hammer surveys complement coring to reduce costs

Rebound hammers, also known as Schmidt hammers, are the most commonly used instrument for non-destructive *in situ* concrete strength testing. Schmidt hammers are popular because they are inexpensive, easy to use, relatively quick, and of course, non-destructive. Schmidt hammers determine the surface hardness, which is correlated to compressive strength, or used for uniformity testing to locate weaker areas in the structure.

A rebound hammer survey is recommended to identify the best locations for coring and reduce the number of cores required, increasing efficiency and reducing costs. Furthermore, rebound and core testing data can be compared and correlated to provide an overall assessment of the entire structure.

Schmidt hammer testing gives reliable estimates of *in situ* concrete strength if the testing is done according to the relevant standards. EN 12504-2 provides the method for determination of the rebound number at one test location. EN13791 provides the method for determination of the in-situ compressive strength using NDT methods.

To determine the compressive strength of a test region according to EN13791, you must make measurements at a minimum of 9 test locations. Then they must be evaluated according to certain rules.

For each impact measurement, the user must unlock the Schmidt hammer, execute the impact, read the scale, and note down the measurement. When all the impacts have been conducted, the user must then calculate the median value and compare each value to the median, then reject any measurements that differ from the median by more than 30%. The rebound value can then be calculated.

The Original Schmidt Live saves time in both data collection and report generation

The new Original Schmidt Live Type N from Proceq uses automation to remove all the effort from obtaining a rebound number. It also presents the first time where a hammer has been able to include test region reporting. It makes testing in accordance with standards simple, providing confidence in *in situ* concrete strength and structure safety.

An Original Schmidt Live user can conduct all 9 hammer impacts in a row without stopping, and then the result can be obtaining either directly on the hammer or via the mobile app. The Original Schmidt Live iPhone app promotes simplicity for the user as it automatically records each impact reading, verifies the sequence, and calculates the rebound number according to the major standards.

Additionally, hammer calibration is tracked automatically, and the app’s logbook functionality makes tracing and reporting measurements simple. Further to this and unlike classical R-value hammers, the Original Schmidt Live makes the users job easier by correcting the result for the impact angle automatically.
The measurements and processing for each rebound value can be completed in under one minute, less than 10% of the time it takes to conduct and record the measurements and calculations manually. Hence, the Original Schmidt Live increases productivity by 90% while reducing the risk of obtaining inaccurate results due to human error.

References:

2. ‘Testing the compressive strength of concrete’,
3. ‘Original Schmidt Live – most advanced concrete strength and uniformity test hammer’,
   https://www.proceq.com/product/original-schmidt-live/

ENDS

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About Proceq SA
Proceq of Switzerland is shaping the future of portable materials testing (NDT). At Proceq’s Global Summit in September 2017 (https://www.proceq.com/company/news-events/show/proceq-global-summit-2017), the company released multiple state of the art devices, utilizing latest technologies from Internet of Things (IoT), cloud computing and artificial intelligence (A.I.) with ultra-user friendly interfaces – a true revolution for the NDT industry and setting a new benchmark within the sector. Proceq, part of the Tectus Group, has been providing innovative testing solutions since 1954 and its strong research and development team in Switzerland continues to create high quality Swiss-manufactured products. With subsidiaries in North and South America, United Kingdom, Russia, the Middle East, China and Singapore, Proceq provides its international customers with excellent local support.

www.proceq.com

About Zehntner
The Zehntner brand is synonymous with Swiss-made high quality electronic and physical measuring and testing instruments. Zehntner, acquired by Proceq on January 1, 2018, specializes in the quality control of surfaces, more specifically, in gloss measurement, retro-reflectometry and other testing.

www.zehntner.com
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The Tectus Group and associated companies is a family-owned multi-national business with headquarters in Zurich, Switzerland. The company has diverse investments and operations across six market segments – engineering & construction, real estate, Internet of Things & sensing, digital health, entertainment & lifestyle, advisory & investments. No matter what their specialist area or territories covered, all of the organizations share the goals of being best-in-class and setting new benchmarks.

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About Tectus Dreamlab

Tectus Dreamlab Pte Ltd was established at Fusionopolis in Singapore in November 2015 by the Tectus Group, to focus on cutting-edge, cross-functional research. The Tectus Dreamlab team works on cross-disciplinary R&D projects that leverage existing expertise within the Tectus Group, combined with the novel technologies and capabilities of various research platforms in Singapore.

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About Screening Eagle

One of the premier initiatives of Tectus Dreamlab is the Screening Eagle Platform (https://www.youtube.com/watch?v=5SBoXz_wO-8) a research project to create a holistic platform for asset monitoring, maintenance and inspection, which will help ensure optimal performance of infrastructure investment worth around US$ 57 trillion globally until 2020. In addition to tapping into global trends of Virtual and Augmented Reality (VR and AR), the Internet of Things (IoT), mobile computing, big data, cloud computing and drones, this new facility also fosters frequent interactions with customers and partners in the region.

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