



Universität Stuttgart

Institut für Werkstoffe im Bauwesen

Abteilung Werkstoffe und Konstruktion

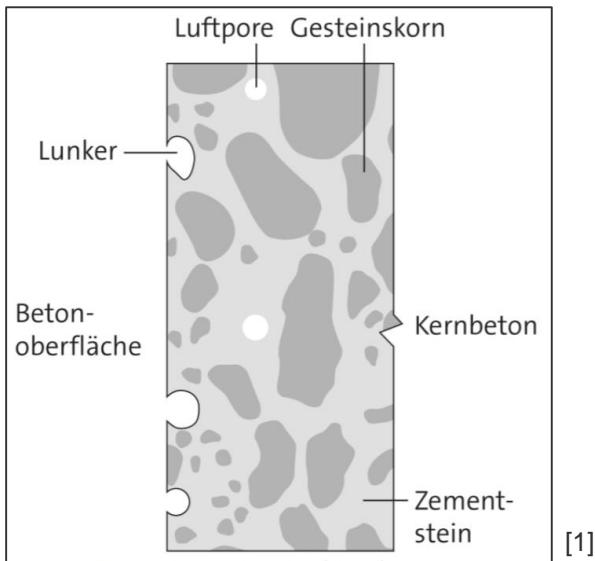


Rapid method for determining the sedimentation stability of concrete

A. Gecgel and Dr.-Ing. C. Baumert

IWB

Need for compaction work



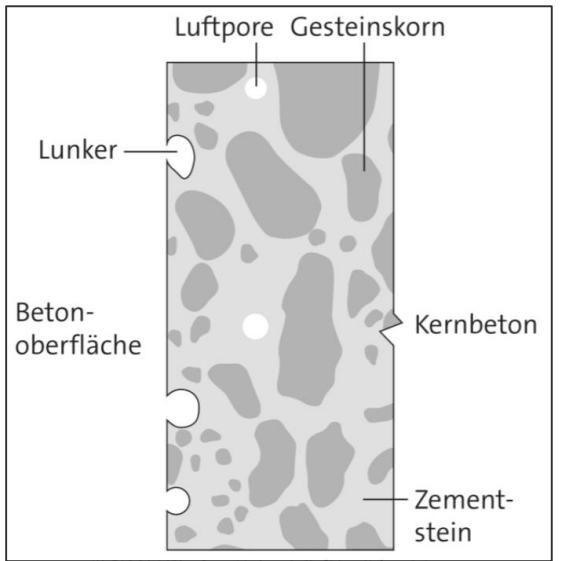
Ideal
amount of
compaction
work
?



Blowholes due to insufficient compaction work

Sedimentation due too much compaction work

Need for compaction work



Blowholes due to insufficient compaction work



Sedimentation due to too much compaction work

Need for compaction work

F1	F2	F3	F4	F5	F6	SVB
Stampfen	starkes Verdichten	normales Verdichten	wenig Verdichten	leichtes Verdichten (Stochern, Klopfen)	leichtes Verdichten (Schwabbeln)	kein Verdichten
Verdichtungsaufwand						

[3]

Bild 5: Verdichtungsaufwand in Abhängigkeit von der Konsistenz des Betons

- Principle: Reduce compaction work as the slump flow increases
- But no exact details of the compaction work
- No consideration of the mixing design

Need for compaction work

F1	F2	F3	F4	F5	F6	SVB
Stampfen	starkes Verdichten	normales Verdichten	wenig Verdichten	leichtes Verdichten (Stochern, Klopfen)	leichtes Verdichten (Schwabbeln)	kein Verdichten
Verdichtungsaufwand						[3]

Step 1:

Calculation of the compaction work in order to reproduce it on the vibrating table :

- Poker
- Rodding/ Tamping according to literature
- Buffing

Need for compaction work

Rütteltisch

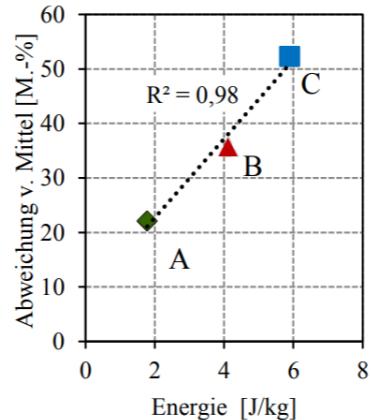
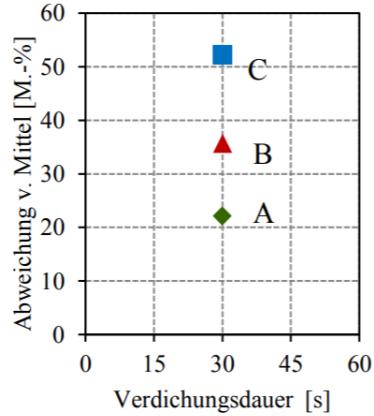
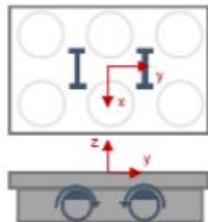
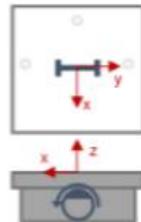
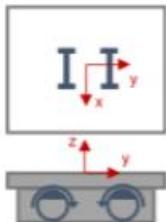
A



B



C

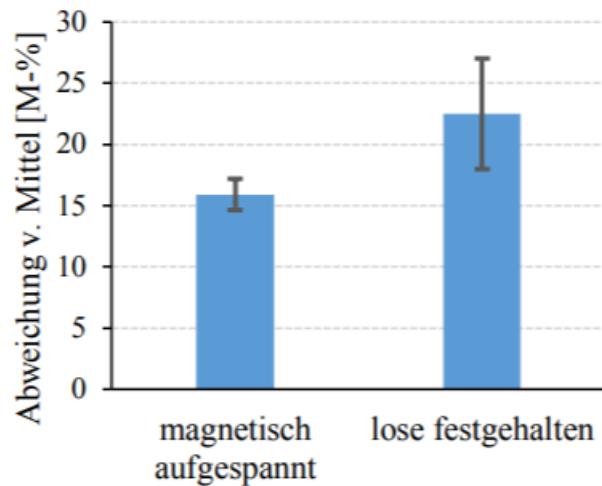


[4]

The vibration tables used differ in the arrangement and number of flywheel masses, producing differently directed vibrations and different vibration amplitudes.

Need for compaction work

Influence of the attachment to the vibrating table



[4]

Need for compaction work

The compaction work of a vibrating table depends on:

- Frequency (variable due to speed regulation using a frequency converter)
- Amplitude or vibration amplitude (fixed by adjusted unbalance of the vibrator)
- Duration of compaction

Problem in practice:

"visually, however, it was ... noticeable that during compaction the highly viscous concrete ... as a whole moved in a rather "roller-like" horizontally rotating motion, instead of venting“ [5]

Settings on conventional vibrating table (frequency) not always sufficient to introduce compaction work !

Procedure according to the BAW –data sheet

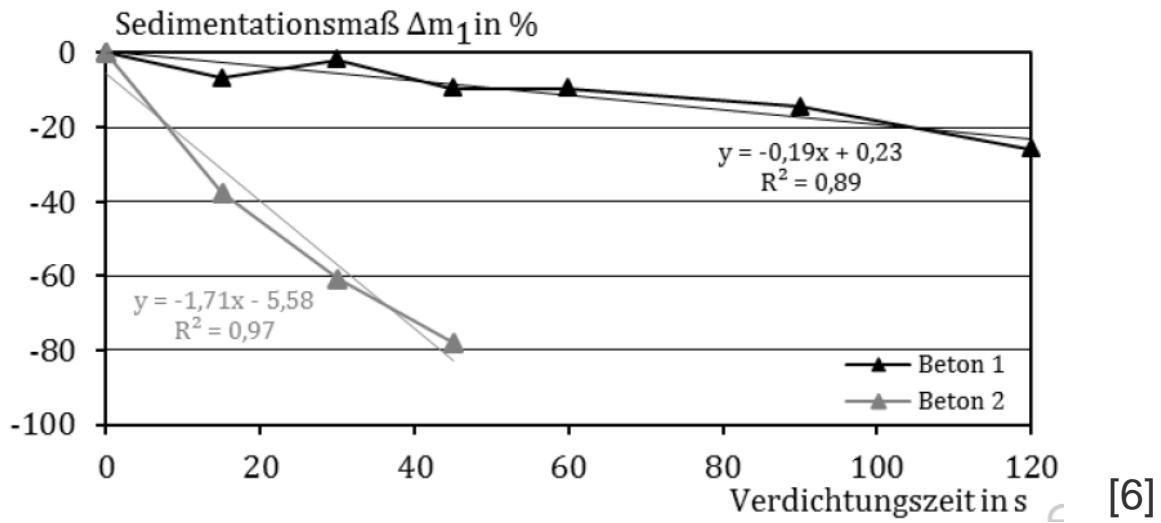


Cylinder segments



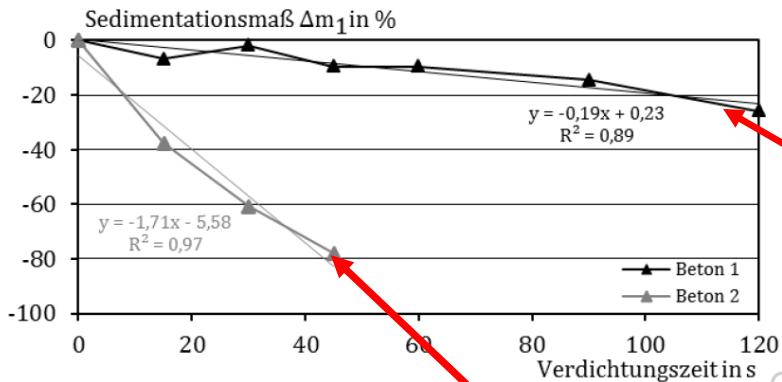
Procedure according to the BAW –data sheet

Result:



Which concrete would you choose?

Procedure according to the BAW –data sheet



What is required for this?

- **7** Auswaschversuche
- mit 7 3-fach-teilbaren Zylindern
- und 7 verschiedenen Verdichtungszeiten
- an eine Charge (?)

- **4** Auswaschversuche
- mit 4 3-fach-teilbaren Zylindern
- und 4 verschiedenen Verdichtungszeiten
- an eine Charge (?)

Practical ?



[6]

Alternative measurement methods according to literature

Mesbah et. Al



[2]

Solution: IWB / Form+Test / Ludwig

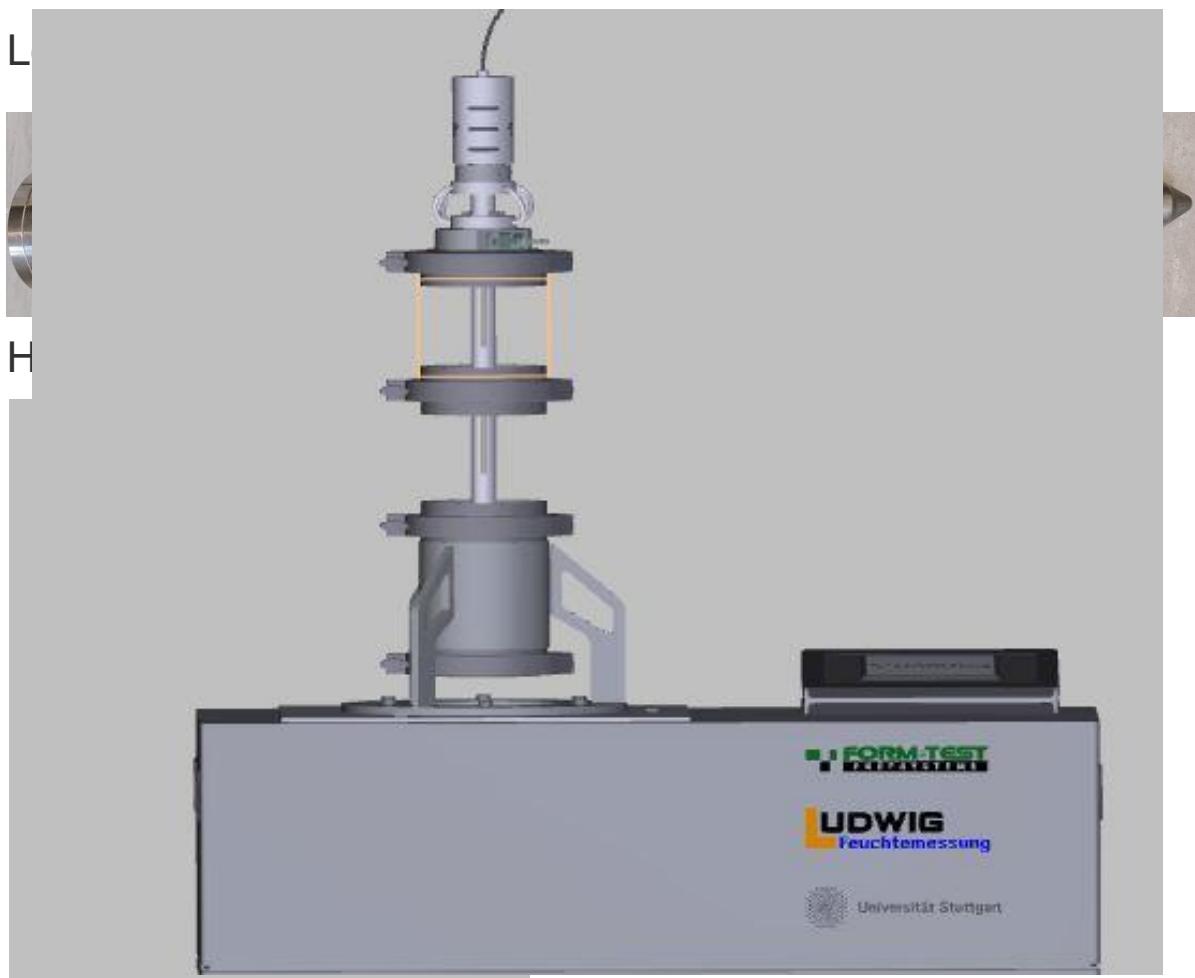
Low-cost-Version (with ordinary vibrating table)



High-End-Version



Solution: IWB / Form+Test / Ludwig

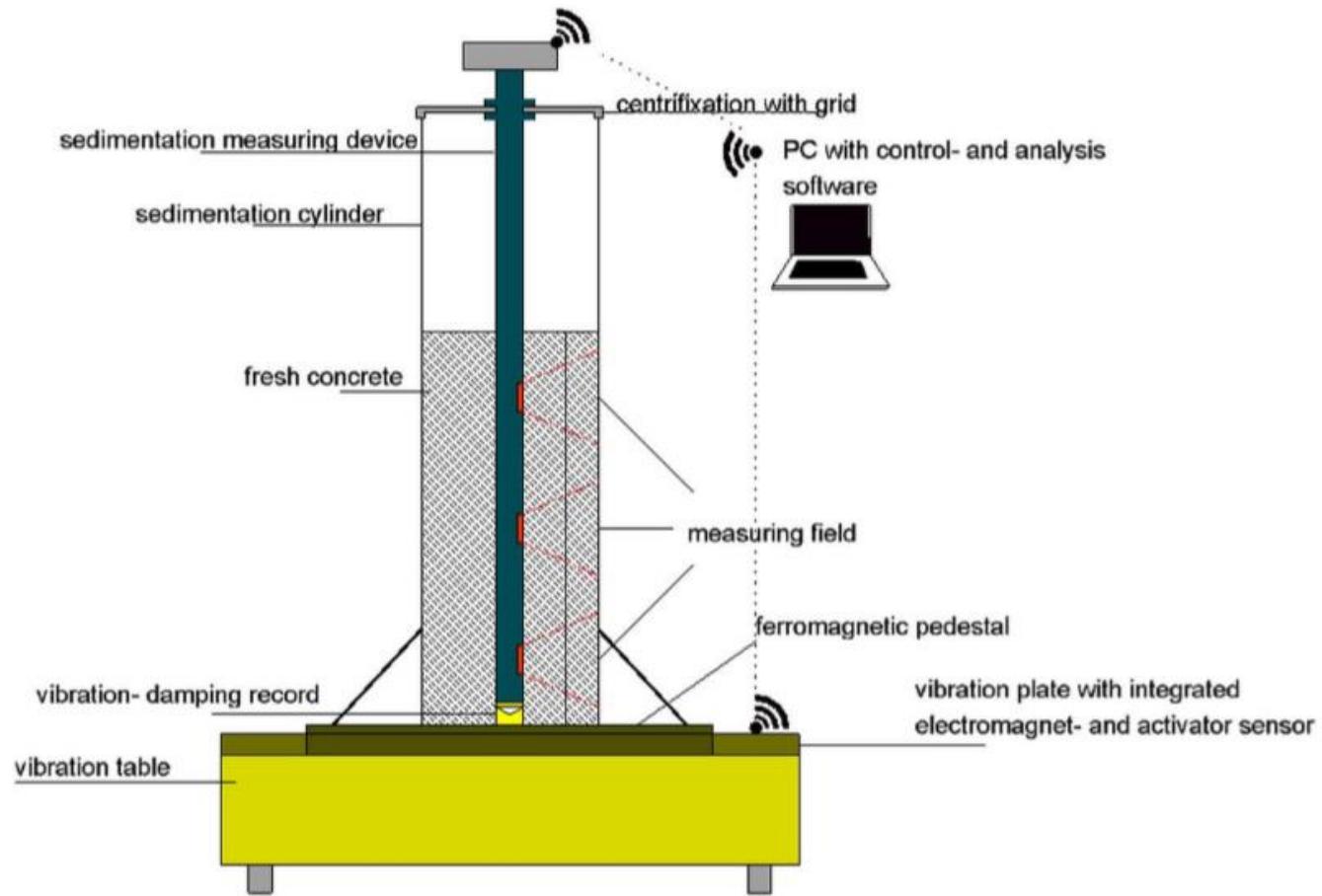


Solution IWB / Form+Test / Ludwig

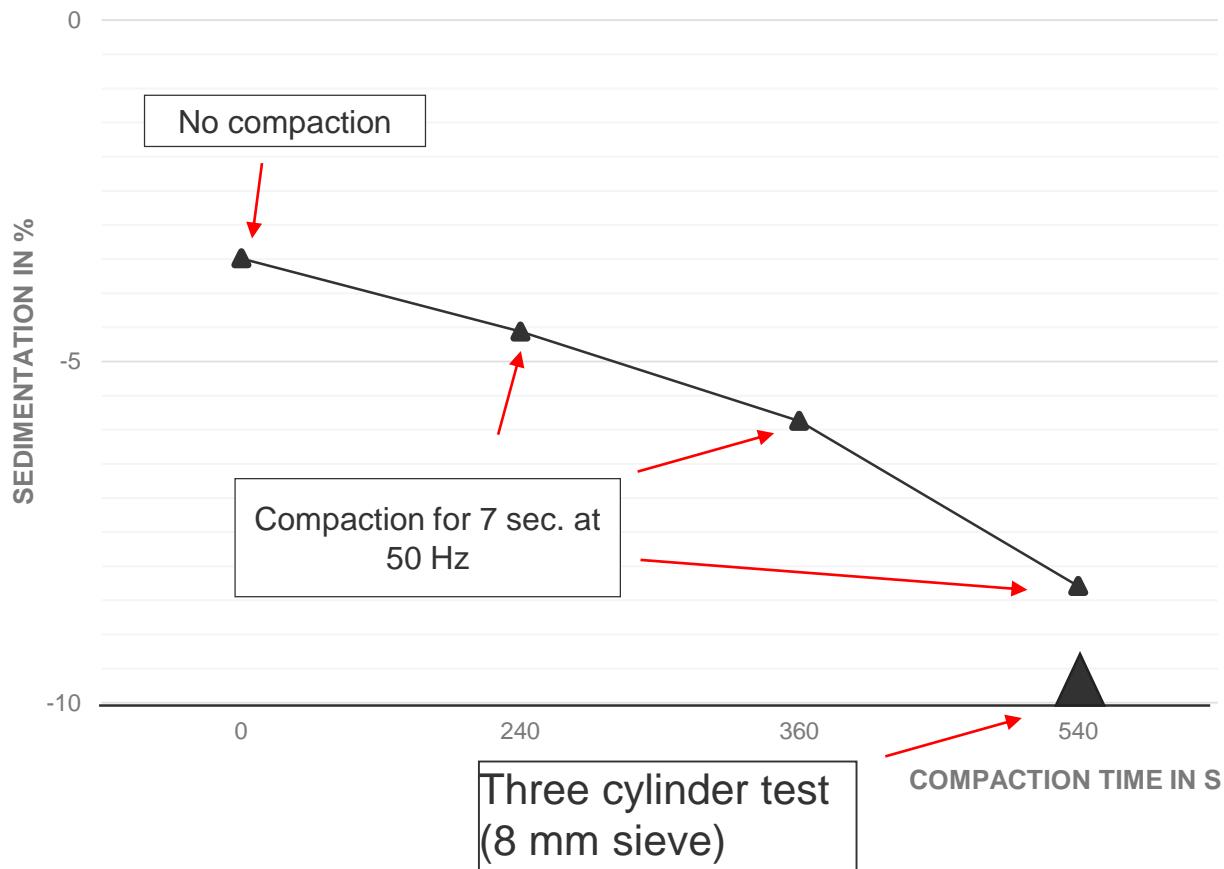
Benefits:

- Control of the water quantity (w/c-value) because of classical moisture measuring sensor
- **Frequency and amplitude** can be freely selected for the vibrating table
- Acceleration sensor to measure the **actual** compaction work
- Automated sequence for compaction processes and measurements
- Automated evaluation according to **BAW data sheet**
- Complete documentation of the measured values
- Significantly faster / significantly less workload

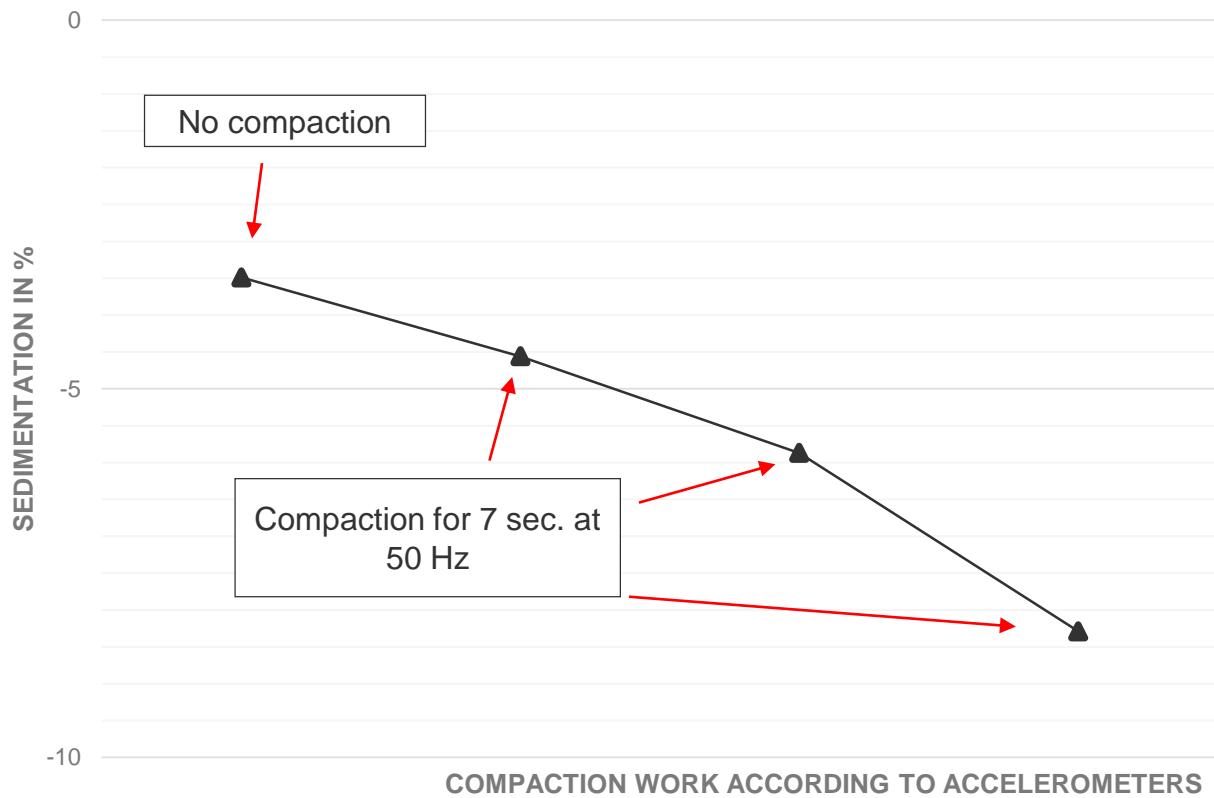
Technical structure



Solution IWB / Form+Test / Ludwig



Solution IWB / Form+Test / Ludwig



Sources

- [1] <https://www.holcimpartner.ch/de/betonpraxis>
- [2] Mesbah, H.A; Electrical conductivity method to assess static stability of self-consolidating concrete (2011)
- [3] Informationszentrum Beton; Bereiten und Verarbeiten von Beton, Zement-Merkblatt B7
- [4] Begemann, Ch.; Prüfverfahren zur Bewertung der Mischungsstabilität von Beton unter Rüttleinwirkung (2019)
- [5] Kränkel, T.; Leichtverdichtbare Betone in der praktischen Anwendung; 59. DAfStb-Kolloquium (2018)
- [6] BAW-Merkblatt; Entmischungssensibilität von Beton (MESB) (2019)



Vielen Dank!



Dr.-Ing Christian Baumert

E-Mail Christian.baumert@iwb.uni-stuttgart.de

Telefon +49 (0) 711 685- 62794

Fax +49 (0) 711 685-67681

Universität Stuttgart
Institut für Werkstoffe im Bauwesen
Werkstoffe und Konstruktion