Spatial variability of concrete properties within a building component

Streuung der Betoneigenschaften im Bauteil

**Funding:** National (Switzerland)

**Duration:** Jan 2004 - Aug 2007

**Status:** Complete with results

**Background & policy context:**

One of the basic problems in quality control and condition assessment of structures of buildings is the lack of detailed data. Therefore the first aim of the suggested project is collection of measurements of permeability and porosity by conducting a number of tests. Thereafter focus will be laid on establishing a consistent probabilistic model for the quantification of the inspection results. Condition indicators will be formulated based on the model and can serve as acceptance rules.

**Objectives:**

i) Determination of the spatial variability of concrete properties (permeability and porosity) in selected structural components

ii) Evaluation of the collected data

iii) Use the inspection results to develop a probabilistic method for the quantification of the spatial variability which facilitates the formulation of acceptance rules in regard of the spatial variability of porosity and permeability

**Methodology:**

In the first phase, a model for the data analysis is designed to optimize the efficiency of the planned component studies. The number of samples required and the form of the examination raster was defined. Subsequently, the components of the study are identified.

In the second phase the first component is examined. With the Torrent method the quality of concrete cover at the age of about 28 days is recorded. The measurements are carried out on the basis of the grid defined in the first phase. At the same measuring points as in the Torrent method cores are removed. The porosity of the combining and the inner concrete will be determined according to SIA 162/1 (water saturation, air pore volume, water conductivity) and compared with the permeability data of the concrete cover.

In the third project phase the collected data that was developed in the first project phase model will be evaluated. On the one hand the model itself and on the other hand, the extraction grid used should be reviewed and adjusted as necessary.

After validation of the used methods, the other components are examined in the fourth phase of the project.

In the fifth phase of the project, the analysis of collected data is done. The developed and validated model should make possible to make less concrete sample, an indication of the likely spread of porosity and permeability in a reference to the survey. With regard to the application of the model and the sampling of the concrete samples, recommendations are formulated.

**Parent Programmes:**

[ARAMIS - ARAMIS information system](#)

**Institute type:** Public institution
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Switzerland:

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Key Results:
The following results released:
- a model for the data analysis,
- analysis of quality of concrete cover with the Torrent method,
- analysis of collected data.

Publications:
auf Antrag der Arbeitsgruppe Brückenforschung (AGB). Eidgenössisches Departement für Umwelt,
Verkehr, Energie und Kommunikation, Bundesamt für Strassen – Vol. 611, Schweiz Bundesamt für
Strassen
within a building component. Final report, Astra, Switzerland
for concrete structures. In: Cho, Frangopol, Ang (Eds.), Life-Cycle Cost and Performance of Civil

STRIA Roadmaps: Vehicle design and manufacturing, Infrastructure
Transport mode: Road transport
Transport sectors: Passenger transport, Freight transport
Geo-spatial type: Other