FACULTY OF ENGINEERING SCIENCE
DEPARTMENT OF CIVIL ENGINEERING
KASTEELPARK ARENBERG 40
3001 HEVERLEE, BELGIUM

LEUVEN October 2024

README FILE

Author: Constantijn Martens

GENERAL INFORMATION

G01. Name of the database

KUL-edCCRC: Experimental Datasets for Concrete Cracking due to Reinforcement Corrosion

G02. Description of the database

This database presents a comprehensive collection of experimental data from several test programs on corrosion of reinforced concrete, conducted at the Reyntjens Laboratory of KU Leuven (Belgium). It contains detailed information on a large amount of parameters, such as sample geometry, concrete composition, material properties, reinforcement layout, pre-cracking conditions, corrosion conditions, corrosion-induced cracks and corresponding corrosion levels.

G03. Keywords (author defined)

Concrete – Reinforcement – Corrosion – Crack Width – Mass Loss

G04. Contact information

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FILE OVERVIEW

F01. List of file names

GENERAL:

00_README

DATA FILES:

01_KUL-edCCRC-Dataset1: file containing experimental data from an accelerated corrosion test program on RC prisms by Van Steen et al. (2019).

02_KUL-edCCRC-Dataset2: file containing experimental data from an accelerated corrosion test program on RC prisms by Van Beirendonck et al. (2022).

03_KUL-edCCRC-Dataset3: file containing experimental data from an accelerated corrosion test program on RC prisms by Van Beirendonck et al. (2022).

04_KUL-edCCRC-Dataset4: file containing experimental data from an accelerated corrosion test program on RC beams by Nasser et al. (2021).

05_KUL-edCCRC-Dataset5: file containing experimental data from an accelerated corrosion test program on RC beams by Nasser et al. (2022).

06_KUL-edCCRC-Dataset6: file containing experimental data from an accelerated corrosion test program on RC beams by Vandecruys et al. (2023).

07_KUL-edCCRC-Dataset7: file containing experimental data from an accelerated corrosion test program on RC beams by Vandecruys et al. (2022).

F02. File format

.mat, .pdf

F03. Software

MATLAB - MathWorks

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F04. File version

Version 1.0

STORAGE INFORMATION

S01. Storage location

KU Leuven Research Data Repository (RDR)

METHODOLOGICAL INFORMATION

M03. Data collecting method

Detailed information on the data collecting method(s) and experimental setup(s) can be found in the publications corresponding to the KUL-edCCRC database. A complete overview of the experimental programs, the applied definitions and the calculation methods can be found in the accompanying publication by **Martens et al. (2024)**, see reference 1 in Section R01 below.

DATA ACCESS AND SHARING

A01. Recommended citation for the database itself

Martens, C., Vandecruys, E., Van Steen, C., Nasser, H., Verstrynge, E. (2024). "KUL-edCCRC: experimental datasets for Concrete Cracking due to Reinforcement Corrosion", DOI: 10.48804/WO62A4, KU Leuven RDR, V1.

A02. License information, restrictions on use

Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0)

DATA SPECIFIC INFORMATION (ABOUT THE DATA THEMSELVES)

D01. Full names and definitions for columns (and rows)

Column	Column Name	Unit	Description
1	SampleID		Name of the RC sample, as defined in the publication(s) that describe(s) the experimental test program.
2	Length	mm	Geometry of the RC sample.
3	Width	mm	
4	Height	mm	
5	CementType		Type of cement used in the concrete mix.
6	WaterCementRatio		Water-cement ratio used in the concrete mix
7	ChlorideContent	%	Chloride content used in the concrete mix.
8	ConcreteClass		Concrete class after 28 days.
9	CompressiveStrength	MPa	Mean (cube) concrete compressive strength after 28 days.
10	TensileStrength	MPa	Mean concrete tensile strength after 28 days.
11	ReinforcementType		Type of reinforcement (smooth/ribbed).
12	SteelGrade		Grade of the embedded reinforcement steel.
13	ConcreteCover	mm	Concrete cover thickness on top of the longitudinal, corroding rebar(s).
14	TensileRebarDiameter	mm	Diameter of the longitudinal, corroding rebar(s).
15	CoverDiameterRatio		Ratio between the diameter of the longitudinal, corroding rebar(s) and the concrete cover thickness.
16	NrTensileRebars		Number of tensile rebars embedded in RC sample.
17	NrCorrodingTensileRebars		Number of corroding tensile rebars in RC sample.
18	EmbeddedRebarLength	mm	Embedded length per longitudinal, corroding rebar in RC sample.
19	StirrupsDiameter	mm	Diameter of the shear reinforcement.
20	NrStirrups		Number of stirrups embedded in RC sample.
21	NrCorrodingStirrups		Number of corroding stirrups in RC sample.
22	PreCrack		Application of mechanical cracking before the corrosion process (yes/no).
23	PreCrackConditions		Conditions of the mechanical cracks (i.e. three-point bending test).
24	PreCrackLocation		Location(s) of the mechanical cracks.

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25	PreCrackWidth	mm	Width of the mechanical cracks as measured on the concrete surface.
26	CorrosionProcess		Applied corrosion conditions.
27	ChloridesInSaltSolution	%	Amount of chlorides in electrolyte solution or spray solution.
28	CurrentDensity	µA/cm²	Applied/measured current density.
29	CorrosionLength	mm	Corrosion length of longitudinal, corroding rebar(s).
30	GridLength	mm	Interval length along the longitudinal direction as applied during crack width measurements.
31	NrCorrosionCracks		Number of longitudinal corrosion cracks visible at the top surface.
32	EqCrackWidth	mm	Equivalent crack width of the segment, according to the definition stated in **Martens et al. (2024)**, see reference 1 in Section R01 below.
33	MaxCrackWidth	mm	Maximum measured crack width within the segment.
34	RebarSegmentLength	mm	Segment length used for calculation of equivalent crack width and equivalent rebar mass loss.
35	EqMassLoss	%	Equivalent rebar mass loss of the segment, according to the definition stated in **Martens et al. (2024)**, see reference 1 in Section R01 below.

D04. Symbols for missing data

Missing data is represented by a 'NaN' value in the table's cell. If the column/parameter does not apply to a certain experimental program/dataset, 'N/A' ('not applicable') is displayed in the table's cell.

RELATIONSHIPS

R01. Publications related to this database

REFERENCE FOR APPLIED DEFINITIONS AND PUBLICATION OF THE KUL-EDCCRC DATABASE:

1. Martens, C., Botte, W., Caspeele, R., Verstrynge, E. (2024). Bayesian updating of relationships between crack width and corrosion level in reinforced concrete based on a large set of experimental data. Structural Concrete. DOI: 10.1002/suco.202400581.

Lirias URL: https://lirias.kuleuven.be/4190788 (related to KUL-edCCRC database and processing)

Other related publications

2. Verstrynge, E., Martens, C., Caspeele, R. (2023). Experimental datasets and model uncertainty of empirical relations for rebar corrosion assessment. In: Proceedings of the CACRCS days 2023, 4th edition, Capacity Assessment of Corroded Reinforced Concrete Structures: from Research to Daily Engineering Evaluation, 12 Sept 2023 - 16 Sept 2023. Parma, Italy.

   Lirias URL: https://lirias.kuleuven.be/4131072 (related to KUL-edCCRC database)

3. Martens, C., Nasser, H., Van Steen, C., Caspeele, R., Verstrynge, E. (2022). The relation between concrete crack width and rebar corrosion level validated on a large set of experimental data. In: Concrete Innovation for Sustainability, (2160-2169). Presented at the 6th fib International Congress 2022, Oslo, Norway, 12 Jun 2022 - 16 Jun 2022. ISBN: 978-2-940643-15-8.

   Lirias URL: https://lirias.kuleuven.be/3764446 (related to experimental work of datasets 1, 2, 3, 4, 5 and 7)

4. Van Steen, C., Verstrynge, E., Wevers, M., Vandewalle, L. (2019). Assessing the bond behaviour of corroded smooth and ribbed rebars with acoustic emission monitoring. In: Cement and Concrete Research, Vol. 120, 176-186. DOI: 10.1016/j.cemconres.2019.03.023.

   Lirias URL: https://lirias.kuleuven.be/2784076 (related to experimental work of dataset 1)

5. Van Beirendonck, T., Van Steen, C., Verstrynge, E. (2022). Experimental study of the bond degradation in concrete due to reinforcement corrosion. In: proceedings of the 14th fib PhD symposium in Civil Engineering, (475-482). Presented at the 14th fib PhD symposium in Civil Engineering, Rome, Italy, 05 Sep 2022 - 07 Sep 2022. ISBN: 978-2-940643-17-2.

   Lirias URL: https://lirias.kuleuven.be/3872631 (related to experimental work of datasets 1, 2 and 3)

6. Nasser, H., Van Steen, C., Vandewalle, L., Verstrynge, E. (2021). An experimental assessment of corrosion damage and bending capacity reduction of singly reinforced concrete beams subjected to accelerated corrosion. In: Construction and Building Materials, Vol. 286, 122773. DOI: 10.1016/j.conbuildmat.2021.122773

   Lirias URL: https://lirias.kuleuven.be/3418644 (related to experimental work of dataset 4)

7. Nasser, H., Vandewalle, L., Verstrynge, E. (2022). Effect of pre-existing longitudinal and transverse corrosion cracks on the flexural behaviour of corroded RC beams. In: Construction and Building Materials, Vol. 319, 126141. DOI: 10.1016/j.conbuildmat.2021.126141.

   Lirias URL: https://lirias.kuleuven.be/3656259 (related to experimental work of dataset 5)

8. Vandecruys, E., van de Velde, M., Reynders, E., Lombaert, G., Verstrynge, E. (2023). Experimental study on acoustic emission sensing and vibration monitoring of corroding reinforced concrete beams. In: Engineering Structures, Vol. 293, 116553. DOI: 10.1016/j.engstruct.2023.116553.

   Lirias URL: https://lirias.kuleuven.be/4093087 (related to experimental work of dataset 6)

9. Vandecruys, E., Martens, C., Van Steen, C., Nasser, H., Lombaert, G., Verstrynge, E. (2022). Preliminary results on acoustic emission and vibration-based monitoring of locally corroded reinforced concrete beams. In: Proceedings of the international symposium on non-destructive testing in civil engineering. Presented at the international symposium on non-destructive testing in civil engineering (NDT-CE), Zurich, Switzerland, 16 Aug 2022 - 18 Aug 2022. DOI: 10.58286/27258.

   Lirias URL: https://lirias.kuleuven.be/3790579 (related to experimental work of dataset 7)