

A 1.3 Templates

Manual for Final Template Formatting

The **excel file template** consists of 2 or more sheets based on the problem solved:

- 1st sheet = the name of the excel file (name of the problem solved with brief description, e.g. the name of the standard used)
- 2nd sheet = Literature
- 3rd and others – any other relevant information (e.g. table of material properties etc.)

Notation	Variable	Value	Unit
x_c	Carbonation depth at time t	3.034562	mm

$$x_c = \psi \sqrt{631 \cdot 10^{11} k_c \cdot k_{cc} \cdot t}$$

Carbonation_fib Model Code Literature

1st sheet:

Notation	Variable	Value	Unit
t	Time of exposure	50	years
c_{atm}	CO ₂ content in the atmosphere	600	mg/m ³
h	Relative humidity	70	%
k_{cc}	Exponent of regression of execution transfer parameter function	-0.587	
k_c	Exponent of regression of execution transfer parameter function	-0.587	
k_{cc}	Inverse effective carbonation resistance of dry concrete from ACC-test	5.20E-11	1/(m ² /kg/m ³)
k_c	Regression parameter of inverse effective carbonation resistance function	1.25	
k_{cc}	Error term of inverse effective carbonation resistance function	1.00E-11	1/(m ² /kg/m ³)
F_{eff}	Days with rainfall more than 2.5 mm/year	60.00	days
P_{eff}	Probability of driving rain	1.00	
k_{cc}	Exponent of regression of weather function	0.446	
k_c	Exponent of regression of weather function	0.446	
k_{cc}	Uncertainty factor of model	1.00	

Notation	Variable	Value	Unit
k_{cc}	Execution transfer parameter	1	
k_c	Inverse carbonation resistance under natural carbonation conditions	7.50E-11	1/(m ² /kg/m ³)
F_{eff}	Days with rainfall more than 2.5 mm/year (F_{eff} in years)	0.16	years
P_{eff}	Reference relative humidity (according to ACC method)	65.00	%
k_{cc}	Environmental function	0.85525	
k_c	Power of weather function	0.22482	years
k_{cc}	Time of reference (28 days)	0.076712	years
k_c	Weather function	0.10056	years
k_{cc}	Carbonation rate	3.1048E-7	mm ² /year

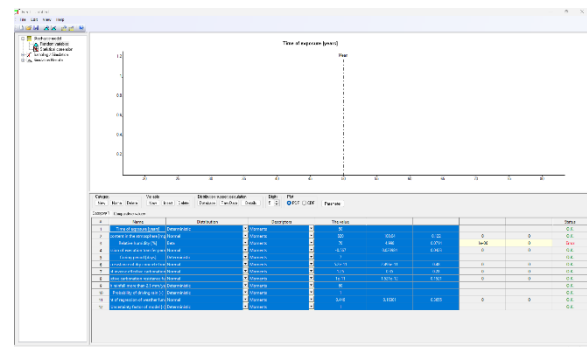
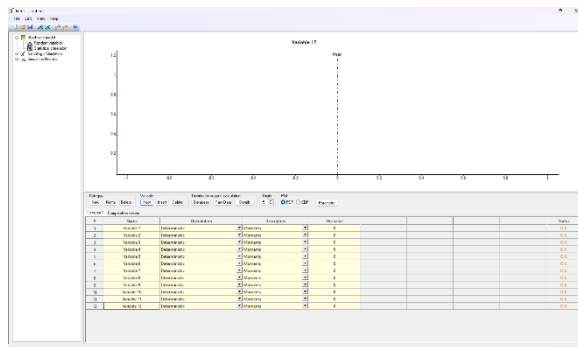
Notation	Variable	Value	Unit
x_c	Carbonation depth at time t	3.034562	mm

$$x_c = \psi \sqrt{631 \cdot 10^{11} k_c \cdot k_{cc} \cdot (k_c \cdot R_{\text{eff}} \cdot C_{\text{CO}_2} + 1) \cdot C_{\text{CO}_2} \cdot 10^{-6} \cdot \sqrt{t} \cdot W}$$

- Values of input parameters for the calculation in A column
- Notation and description of the input
- The same notation and description of inputs in the Table of 'Input variables' definition
- Values of inputs used for the calculation (these are taken from values in A column) and units used for the inputs definition
- All the supporting calculations based on inputs – notation, description, calculated value, unit + equation (the source of literature can be mentioned in P column)
- Output calculation + equation and the source of literature (the output value in B column is taken from this calculation – F46 cell here)
- Stochastic model – statistical definition of input parameters, the source of literature in P column, other characteristics (such as limits, characteristic and design values etc.) from R to other columns

- The area of stochastic model from I to N columns corresponding to input parameters (rows 17–28 in this case) need to be in the format based on FReET software needs (no sub/superscripts in column I, name of distribution type based on FReET with the first capital letter, descriptor 'Moments' to describe the inputs using Mean, Std and COV values). If everything is ready, the table area can also be copied to a new .fre file as follows:

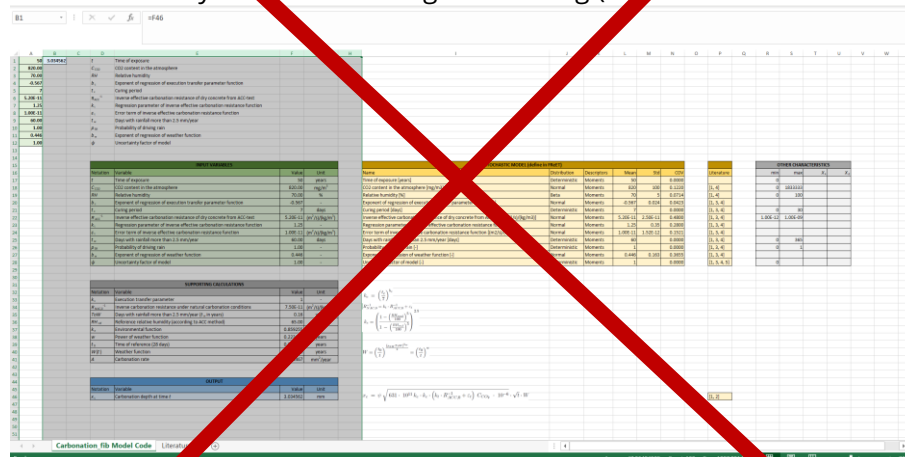
Open a new .fre file and prepare the number of rows corresponding to number of inputs → copy the stochastic model from excel sheet → paste it to the cell 'Name #1' → check and correct if necessary (e.g. limits for variable #3 in this specific case)



The Model analysis in the .fre file does not work for locked cells, so please do not lock the area in the Excel file.

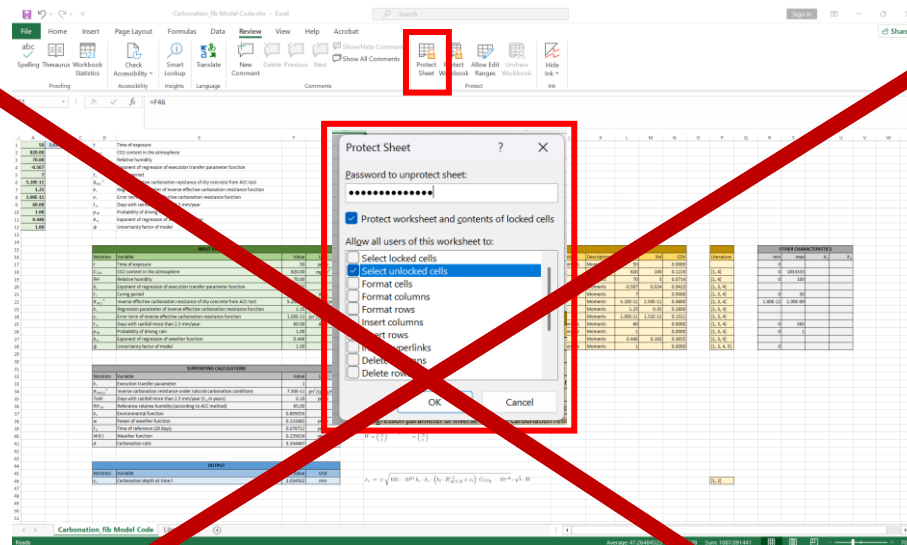
- 1) Press Ctrl + A (select all cells).
Right-click → Format Cells → Lock tab (or Protection).
Uncheck Locked.
Confirm with OK.
--> This tells Excel that the cells will not be protected even if you enable sheet protection.

- 2) Select the area to lock:
Select the cells you want to lock against editing (from B column to H column).



- Right-click again → Format Cells → Lock tab (or Protection).
Check Locked → OK.

- 3) Turn on sheet protection:
On the Review tab, click Protect Sheet.
Check what users are allowed to do ("Select unlocked cells").
Set a password to 'ATCZ00068_IREC' → OK.



--> Result: Locked cells (those you selected in step 2) cannot be changed. Unlocked cells remain freely editable.

4) In case you need to edit the excel template it is necessary to unlock the sheet:

On the Review tab, click Unprotect Sheet.

When the editing is finished lock the area (columns B to H) again.

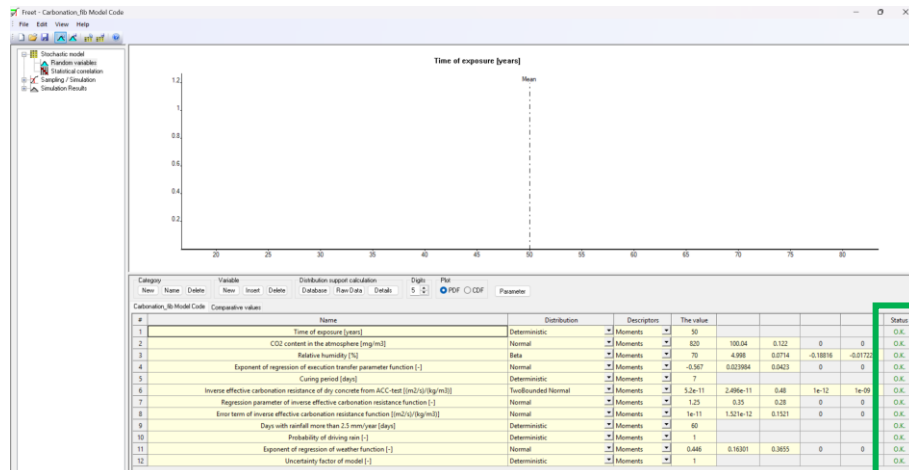
2nd sheet:

- The list of literature sources (notation in A column, citation in B column)

A	B
[1] fib TG 5.6 (2007) fib Model Code for Service Life Design – Proposal for future fib Model Code, 2005.	
[2] Gehlen, Ch. (2000) Probabilistische Lebensdauerbemessung Stahlbetonbauwerken, Zuverlässigkeitsbetrachtungen zur wirksamen Vermeidung von Bewehrungskorrosion. Heft 510 der Schriftenreihe des DMSB, Beuth Verlag, Berlin, Germany.	
[3] Těplý, B., Rovnaníková, M., Vorechovská, D. & Rovnaník, P. (2015) FReET Deterioration Module Program Documentation – Part 1 – Theory. Brno/Cervenka Consulting, Prague, Czech Republic.	
[4] Veselý, V., Těplý, B., Rovnaníková, M., Vorechovská, D. & Rovnaník, P. (2015) FReET Deterioration Module Program Documentation – Part 2 – User Manual. Brno/Cervenka Consulting, Prague, Czech Republic.	
[5] Joint Committee on Structural Safety (2006). Accessible from http://www.jcss.ethz.ch .	

For every excel file please prepare the functional **.fre file** of the same name as excel file consisting of:

- Prescribed stochastic model with 'OK' status



- Loaded correct excel file with **Model function definition** in section 'Model Analysis'

