Raw Mix Proportioning: Three Components to LSF and Silica Ratio

Proportions of three raw materials for a target Kind's lime saturation factor and silica ratio, with the alumina ratio and hydraulic modulus of the mix.

Method: Duda; Cement Data Book; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Target Kind's lime saturation factor	0.92000	
Target silica ratio	2.7000	
SiO_2 in material 1	0.95000	%
Al_2O_3 in material 1	0.92000	%
Fe_2O_3 in material 1	0.38000	%
CaO in material 1	54.600	%
SiO_2 in material 2	68.000	%
Al_2O_3 in material 2	12.600	%
Fe_2O_3 in material 2	2.9500	%
CaO in material 2	5.7000	%
SiO_2 in material 3 (corrective)	11.000	%
Al_2O_3 in material 3 (corrective)	1.5000	%
Fe_2O_3 in material 3 (corrective)	84.200	%
CaO in material 3 (corrective)	0.76000	%

Calculated results

Parameter	Value	Unit
Material 1	78.309	%
Material 2	20.215	%
Material 3	1.4765	%
Alumina ratio of the mix	1.5393	
Hydraulic modulus of the mix	2.1874	

Notes for this case

- Dry-basis proportions. Duda's Example 2.5 prints 69.95 / 27.73 / 2.32 %, but carries an arithmetic slip in a_1 (−31.104 instead of −30.204); the correct solution of his data is 70.57 / 27.15 / 2.28 %.

Formula and method

$$\sum_j w_j \left[2.8\,KS\,S_j + 1.65A_j + 0.35F_j - C_j\right] = 0, \quad \sum_j w_j \left[SR(A_j + F_j) - S_j\right] = 0, \quad \sum_j w_j = 1$$

Variables

KS	Target Kind's lime saturation factor	-
SR	Target silica ratio	-
S_1	SiO_2 in material 1	-
A_1	Al_2O_3 in material 1	-

F_1	Fe_2O_3 in material 1	-
C_1	CaO in material 1	-
S_2	SiO_2 in material 2	-
A_2	Al_2O_3 in material 2	-
F_2	Fe_2O_3 in material 2	-
C_2	CaO in material 2	-
S_3	SiO_2 in material 3 (corrective)	-
A_3	Al_2O_3 in material 3 (corrective)	-
F_3	Fe_2O_3 in material 3 (corrective)	-
C_3	CaO in material 3 (corrective)	-
w_1	Material 1	-
w_2	Material 2	-
w_3	Material 3	-
AR	Alumina ratio of the mix	-
HM	Hydraulic modulus of the mix	-

Method and standards

Two balances and the sum of parts.

Assumptions and limits

- Kind's factor as the lime target.

References

- Duda
- Cement Data Book
- Vol. 1
- 3rd ed. (Bauverlag / Macdonald and Evans, 1985)
- secs. 2.4-2.5
- Examples 2.4 and 2.5

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/chemical/cement/raw-mix-three-component

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.