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Supplementary Material
Dolomitic filler in self-compacting concrete: a review

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Table A.1. Summary of studies using dolomite filler in SCC. For references see main paper.

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Ref.	Dolomite properties	Type of replacement	Level of replacement	Binder type	w/b and SP	Properties Tested	Main findings
[46] 2020	*bulk density = 1500-1800 kg/m^3 *particle density = 2640 kg/m^3 *Grading: 35% (4-8 mm) 47% (0.1-4mm) 18% (0-0.1mm) * Shape: angular	Aggregate replacement	40%	High performance concrete	*W/C = 0.56 *W/B = 0.51 *SP= 1%	* Slump flow *Compressive strength (12390-3) *water permeability (EN 12390-8) *Frost resistance	*Slump flow of 590 mm and corresponding class SF1. *Compressive strength increased up to 72.1 MPa at the age of 28 days and 82.1 MPa in 56 days. * Water penetration was 15mm. * Surface scaling after 28 freeze-thaw cycles was in the range 150 to 250 g/m^2 * General conclusion: It is possible to utilize by-products of dolomite quarries both for conventional concrete and for high-performance self-compacting concrete which is characterized by a high degree of workability and resistance against freezing and thawing cycle.
[10] 2018	*Chemical composition: MgO (6.04%), CaO (43.91%) *particle density = 2900 kg/m^3 *Grading: $X_{10\mu m}$= ~ 24% $X_{50\mu m}$=~85% $X_{80\mu m}$=100% d_{10} = ~4μm d_{50} = ~30μm d_{90} = ~60μm	Pozzolanic replacement (slag only, fly ash only and slag/fly ash mix)	0, 10, 30, 50, 70, and 100 wt%	mortar	w/p = 0.32 *SP = 2.46 – 4.2 kg/m3	*Isothermal calorimetry on paste *mini slump flow *mini V-funnel *compressive strength	*The addition of DP as partial replacement of slag did not cause the delayed time during the induction period of the hydration process of the fresh paste but proportionally reduced the total heat released during 24-h period of hydration of the slag cement-based paste. * the addition of DP to replace FA powder remarkably accelerated the hydration rate of the OPC in ementing binder with either FA and OPC mixture or mixture of slag, FA, and OPC powder. *The mini V-funnel flowing time of the SCMs with/without DP was achieved at 5 or 6 s. The slump flow of the fresh SCMs varied in range of 240–330 mm * The addition of 30% DP had beneficial effect on compressive strength
			30%	concrete	*w/c = 0.63 *w/p = 0.32 *SP= 0.8-1.5% (2.6 – 4.4 kg/m3)	* Abrams cone and T500 * V-funnel *Segregation using V-funnel T5 * J-ring * compressive strength *dynamic Young's modulus (E_d) *dynamic shear modulus (G_d) * ultrasonic pulse velocity (UPV) *Chloride penetration: the surface electrical resistivity (SER) by using 4 point Wenner probe	*All the SCCs gained the expected fresh properties mostly qualifying the technical and practical requirements for the typical SCC *The bulk dry density of the concrete proportionally increased with the increase of the slag/FA ratio. *The compressive strengths of the resultant SCCs produced with the appropriate mortars were in range of 35.4–46.4 MPa at 7 days and those increased to reach a new range of 43.9–63.1 MPa at 28 days. *The 28-day dynamic Young's modulus and dynamic shear modulus of the hardened SCCs were 31.0–32.9 and 12.2–13.9 GPa *The UPV values of the hardened SCCs specimens were in range of 4206–4380 m/s which is good to be used for the concrete structure. *The measurement of the SER of the hardened SCC specimens were in range of 47.8–54.0 Ω cm which intermediately classifying the concrete samples with very low chloride ion permeability

Ref.	Dolomite properties	Type of replacement	Level of replacement	Binder type	w/b and SP	Properties Tested	Main findings
[41,52,57] 2014 and 2015	*Commercial filler and dolomite aggregates *Chemical composition: MgO (21.84%), CaO (30.38%), LOI (47.58%) *particle density = 2860 kg/m3 * Blaine fineness – 163 m2/kg *Grading: $X_{10\mu m}$= ~ 21% $X_{50\mu m}$=~45% $X_{80\mu m}$=~600% d_{10} = ~3µm d_{50} = ~70µm d_{90} = ~100µm	Filler and Aggregates	*Filler quantity=220 kg/m3 *Coarse Agg = 696 kg/m3 *Fine Agg = 862	High performance SCC	*Powder quantity = 670 kg/m3 *w/p = 0.27 *w/c = 0.40 *SP = 1.25% (5.6litre) *VMA = 0.16% (0.7 l)	*Slump flow * Slump flow T500 *L-box *Segregation resistance *Unit weight *Air content *Compressive strength *Autogenous shrinkage *Heat of hydration *Fire resistance	* The fresh properties results were 732mm, 2.08s, 0.94, 5%, 2499 kg/m3, and 1.9% *Compressive strength at 2, 7, 14, 28 and 365 days were 57.3 MPa, 69.1 MPa, 74.2 MPa, 81.1 MPa and 104.2 MPa, respectively. *Modulus of elasticity at 2, 7, 14, 28 and 365 days were 33.7 GPa, 39.6 GPa, 42.4 GPa, 43.3 GPa and 51.0 GPa, respectively. *Autogenous deformation reached 0.20% after 30hrs *Total heat of hydration in the first 70hrs was 320J/g *Dolomite based SCC showed good fire resistance up to 400 ℃
[48] 2013	* Commercial filler *particle density = 2741 kg/m³	Additive	60, 120 ,180 kg/m³	concrete	*W/C = 0.55 *SP=1.8%	*Slump-flow test (EN 12350-8). *V-funnel test (EN 12350-9). *L-box test (EN 12350-10). *Slump-flow test with J-ring (EN 12350-12). *The determination of air content (EN 12350-7) *Density (EN 12350-6). *The compressive strength (EN 12390-3) *Porosity *Carbonation resistance (EN 13295 and UNE 112011-94 (phenolphthalein))	*Slump flow varied between 695 and 810 * V-funnel varied between 2.4-4.7 s *L-box value of 0.99 was obtained *J-ring test had a slump diameter of 760mm and T500 of 5.2-8.9 *Density of 2442kg/m3 and air content of 1.4% were reported *Compressive strength was 50 MPa at 28 days and porosity ~12.26% *Carbonation depth less than 30mm were recorded under the testing regime used. *General conclusion: It was found that this SCC made with commercial dolomite filler had a self-compactability, strength, and durability in regard to the carbonation within the permissible range of SCC.

Ref.	Dolomite properties	Type of replacement	Level of replacement	Binder type	w/b and SP	Properties Tested	Main findings
[51] 2011	*particle density = 2860 kg/m^3 *Specific surface area = 1172.3 m^2/kg *Chemical composition: MgO (37.71%), CaO (55.19%)	Replacement of fly ash	25, 50, 75, and 100%	concrete	*Powder content = 580 kg/m3. *Cement content = 290 kg/m3. * W/B ratio = 0.38. *SP= 1.72-2.62	*Slump flow by Abrams Cone test, *L-box test and *V-funnel at $T_{5minutes}$ test *Compressive strength *Density	*the slump flow was between 550 and 650 mm, which is an indication of good deformability. However, the more the DP the lower the flowability * Increasing the DP replacement level increased the SP dosage. *The L-box ratios for all the mixes were less than the minimum requirements as per EFNARC guide *The SCCs with fly ash and dolomite powders developed strengths ranging from 15.25 to 17.50 MPa, 20.22 to 25.9 MPa and from 33.22 to 37.91 MPa at 3, 7 and 28 days respectively. Mix 1 containing 100% fly ash showed the highest compressive strength at ages, when compared to the other mixes. * The density increased with the increase in the content of dolomite powder at the cost of fly ash. This is due to micro-filler effect caused by the fine-grained dolomite powder
[47] 2005	*bulk density = 1700 kg/m^3 *Grading: (0-2mm) 40-45% (0-0.125mm) * Shape: ellipsoid or sphere	Aggregate replacement	7, 14, 28%	concrete	*W/C = 0.55 *W/B = 0.55 *SP= 1%	*The dry aggregates bulk density *Index of segregation (Three-cylinder test) * Slump flow, spread *Slump flow, to 500 mm *Slump flow, to final *Compressive strength *Modulus of elasticity E *Shrinkage strains *Water absorption *Open capillary pores average rate *The freezing resistance criterion	*The bulk density of the dolomite siftings increases while the mass of the aggregate is changed 7 – 14 %. *The increase of the slump flow of concrete mix was noticed in the concrete mixes with the admixtures of dolomite siftings (from 7 to 14 %), though the requirement of water has not increased. *The stability of the sedimentation it is worth to note that the segregation of the mix is reduced changing 7 - 14 % of all aggregate mass by dolomite siftings. *Dolomite siftings increase concrete compressive strength and modulus of elasticity, also decrease shrinkage strains *Increasing the amount of siftings, the capillary pore average index λ is also increasing; as the result, the water absorption is increased and freezing resistance is decreased.
[49] 2003	*particle density = 2840 kg/m^3 *Water demand (volume water/powder ratio) = 0.7802 *Blaine fineness = 236 m^2/kg *Grading: $X_{10\mu m}$=23.3% $X_{50\mu m}$=60.3% $X_{80\mu m}$=81.6% d_{10} = 2.5µm d_{50} = 37.1µm d_{90} = 97.9µm *Shape: angular low sphericality	Additive	volume filler/cement ratio = 0.64 filler/cement by weight = 0.6	concrete	w/c = 0.5 w/b = 0.31 SP=1.3%	*Filler activity index on mortar *Slump-flow *V-funnel *U-test), *compressive strength, *shrinkage and *freeze-thaw resistance	*The activity index of dolomite was 62% at 1 and 2 d and was 66% at 28 d. *SF = 640mm and t500=1 s. * V-funnel = 6 s. * U-test filling height = 329 mm * Strength at all ages were higher than a reference vibrated concrete. * 1-d strength was 10 MPa and 28-d strength was 59.7 MPa * shrinkage was higher than the reference and dolomite mix had the second largest shrinkage strain of ~550 microstrain after 56 days. *dolomite filler mix had good freezing and thawing resistance which was higher than reference mix. * Scaled materials results of dolomite mix were better than reference mix after 7 and 14 cycles with de-icing salt but was inferior to the mix design after 28 cycles.

Ref.	Dolomite properties	Type of replacement	Level of replacement	Binder type	w/b and SP	Properties Tested	Main findings
[53] 1999	*7 types of commercial dolomite *All has particle density = 2870 kg/m3 *The PSD of each filler is different	filler	* Filler content = 200 kg/m3	*Fine mortar (including sand with maximum particle size of 250 µm)	*W/C = 0.45 *Cement = 325 kg/m3	*Rheometer	*The yield stress and viscosity increased as the fineness of the filler increased * The yield stress ranged between 7.5 to 45 Pa, while the viscoity changed between 0.4 and 2 Pa.s.
[58] 1977	*Chemical composition: MgO (17.9%), CaO (37%) and CO2 (40%) *Fineness: 115, 390, 670 and 960 m2/kg	Cement replacement	10, 20, 30 and 40%	*Cement *Mortar (1:2.75 ratio)	W/C = 0.70	*Compressive strength of mortar *Air content using TGA *Hydration degree using TGA (chemically bound water)	* Increasing the dolomite filler content and fineness increased the strength and decreased the air content