



*Regulatory issues and
geopolymers: how is this
approached in non-nuclear
sectors?*

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Three basic options

- Work within existing specifications
- Work beyond the scope of existing specifications
- Write new, purpose-designed specifications

How can a new material be used..?

- Add it to a standard?
 - Extremely slow; can meet resistance
 - See PD CEN/TR 16912:2016 for a route-map
- National specification
 - E.g. UK “Publicly Available Specification” – not legally a standard
- Technical Assessments/Approvals
 - Product-based specifications, funded by producers of the new product, issued by national approved authorities, accepted across EU
- Many end-users also have the scope to write their own specifications



https://www.brmea.org.uk/documents/European_Standardisation_of_new_and_innovative-cements_Concrete_March_2016.pdf

Two basic approaches to standards

- ***Prescriptive*** standards
 - Specify the allowable ingredients and recipes, with built-in safety margins
 - If a material is made as specified, it is assumed ok to use
- ***Performance-based*** standards
 - Define what a material needs to do (strength, durability) – including how to test
 - Allow the producer to design a material to meet these requirements
 - More scope for innovation, but it takes more work to prove performance
- A lot of standards have elements of both styles
 - EN is moving a lot more toward performance-based standards, but this is contentious...

Alkali-activated cementitious materials – BSI PAS 8820

- Performance-based specification, ‘AACM’ binder chemistry described very broadly
 - Minimal prescription; to avoid overlap with EN 197-1 cement classes, no more than 5% PC
- Following established UK practice where possible
- Basic philosophy – design a ‘reference concrete’ to BS 8500 (UK version of EN 206), and test in parallel
 - Reference should have chemistry as close as possible to the AACM
 - Specified suite of durability tests, same for both materials
 - AACM concrete must perform at least as well as the concrete of known (assumed?) good performance

Ukrainian national standard DSTU B V.2.7-181:2009

TABLE 4. Alkali-activated cement classification according to Ukrainian national standard DSTU B V.2.7-181:2009 (120)

Alkaline cement type	Designation	Content, % by mass					Alkali metal compounds (sodium or potassium)
		Aluminosilicate component					
		Granulated blast-furnace slag	OPC clinker	Fly ash	Basalt		
ACEM I	Slag alkaline cement	ACEM I	90–100	0–10	–	–	1.5–12
	Slag alkaline cement with additive of fly ash	ACEM I–3	55–90	0–10	10–35	–	1.5–12
ACEM II	Alkaline portland cement	ACEM II	–	100	–	–	1.5–12
ACEM III	Alkaline pozzolan cement	ACEM III–3	20–64		36–80	–	1.5–12
		ACEM III-B	←—————→		–	36–80	1.5–12
ACEM IV	Alkaline slag portland cement	ACEM IV	36–89	11–64	–	–	1.5–12
ACEM V	Alkaline composite cement	ACEM V	30–50	5–10	40–65	–	1.5–12

Palomo, A.; Krivenko, P.; Garcia-Lodeiro, I.; Kavalerova, E.; Maltseva, O.; Fernández-Jiménez, A. (2014) A review on alkaline activation: new analytical perspectives. *Mater. Construcc.* 64 [315], e022 <http://dx.doi.org/10.3989/mc.2014.00314>.

End-user specification examples

- Australian national and state roads authorities

AUSTROADS TECHNICAL SPECIFICATION ATS5330


Supply of Geopolymer Concrete



1. Scope

- 1.1 This Austroads Technical Specification covers the requirements for the supply and delivery of Geopolymer Concrete in strength grades up to 50 MPa for use in the following applications:
 - a) gutters, kerbing, drainage channels, footpaths, driveways, shared paths, post footings and safety barrier anchor blocks; and
 - b) minor cast-in-place works or the production of precast elements with a design life not exceeding 50 years, such as stormwater pits and headwalls.

...and ongoing work elsewhere, including...



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New Specification for Alkali Activated Cementitious Materials

[\(What is a Work Item?\)](#)

Developed by Subcommittee: [C01.14](#) | Committee [C01](#) | Contact [Staff Manager](#)



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294-MPA : Mechanical properties of alkali-activated concrete

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Applications and the future

- Essential to develop a solution to a genuine problem
 - Worst-case is “a solution looking for a problem”
- Cost of cement used in a project is usually tiny, vs. the cost of the overall project
 - Are you (or your clients) willing to invest in the “best” materials?
- Standards are unlikely to drive applications, but can support or enable
- Researchers need to understand standards, and develop and use them appropriately