

Master Specification

Part ST-SC-S2

Geopolymer Concrete

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ST-SC-S2 Geopolymer Concrete

1 General

- a) This Master Specification Part specifies the requirements for the supply and placement of geopolymer concrete, including:
 - i) the documentation requirements, as set out in section 2;
 - ii) the concrete production requirements, as set out in section 3;
 - iii) the concrete placement requirements, as set out in section 4;
 - iv) the Hold Point requirements, as set out in section 5; and
 - v) the verification requirements and records, as set out in section 6.
- b) Geopolymer concrete must not be used on structures.
- c) Reinforcing must comply with ST-SC-S6 “Steel Reinforcement”.
- d) The supply and placement of geopolymer concrete of strength grades 20 MPa, 25 MPa and 32 MPa must comply with the Reference Documents, including:
 - i) AS 1379 Specification and supply of concrete;
 - ii) AS 3582.1 Supplementary cementitious materials, Part 1: Fly ash;
 - iii) AS 3582.2 Supplementary cementitious materials, Part 2: Slag - Ground granulated iron blast furnace;
 - iv) AS 3582.3 Supplementary cementitious materials, Part 3: Amorphous silica;
 - v) AS 3600 Concrete structures;
 - vi) AS/NZS ISO 9001 Quality management systems - Requirements; and
 - vii) T41 Guide to Concrete Construction.
- e) For the purpose of this Master Specification Part:
 - i) “geopolymer binder” means binder containing greater than 80% fly ash, ground granulated blast furnace slag (GGBFS) or amorphous silica complying with the requirements of AS 3582.1 Supplementary cementitious materials, Part 1: Fly ash, AS 3582.2 Supplementary cementitious materials, Part 2: Slag - Ground granulated iron blast furnace, and AS 3582.3 Supplementary cementitious materials, Part 3: Amorphous silica, respectively, metakaolin and up to 20% alkaline components; and
 - ii) “geopolymer concrete” means concrete which comprises geopolymer binder, aggregates, water, and admixtures of strength grades 20 MPa, 25 MPa and 32 MPa.

2 Documentation

2.1 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include:

- a) evidence of the supplier’s experience and competency in the manufacture of geopolymer concrete in accordance with section 3b)ii); and
- b) details regarding the mix design and its properties in accordance with section 3b)iii).

2.2 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records must include:

- a) an identification certificate for each load of geopolymer concrete supplied, including identifying the mix as geopolymer concrete, as required by section 3f);
- b) project assessment reports, including identifying the mix as geopolymer concrete, as required by section 3g);
- c) a record of the volume of water added to the freshly mixed geopolymer concrete on Site, in accordance with section 4c); and
- d) the verification records required by Table ST-SC-S2 6-1.

3 Concrete production

- a) Where the Contractor proposes to use geopolymer concrete, the Contractor must submit a request to the Principal, which will constitute a **Hold Point**. Geopolymer concrete must not be used (or shown in the Design Documentation where applicable) until the Hold Point has been released. Where the proposed mix has not been used previously, a proposal for trials must be submitted as part of this request.
- b) The Contractor must:
 - i) ensure that the geopolymer concrete supplier has sound experience and demonstrated competence in the supply of geopolymer concrete;
 - ii) provide documented evidence of the supplier’s experience and competency in the manufacture of geopolymer concrete as part of the Construction Documentation; and
 - iii) provide all relevant details regarding the geopolymer concrete mix design and its properties as part of the Construction Documentation.
- c) The mix design for each geopolymer concrete strength grade must have a unique identification number.
- d) Geopolymer concrete and its constituent materials must be supplied and tested in accordance with AS 1379 Specification and supply of concrete. The concrete plant must operate under a quality system in accordance with AS/NZS ISO 9001 Quality management systems - Requirements. Geopolymer concrete must not be mixed when the air temperature is lower than 5°C or greater than 35°C.
- e) The production of geopolymer concrete must meet the following requirements:
 - i) the geopolymer concrete must be subject to project assessment in accordance with AS 1379 Specification and supply of concrete;
 - ii) the maximum slump at the point of acceptance must be 100 mm;
 - iii) the maximum aggregate size must be 20 mm; and
 - iv) air entrainment is not required.
- f) For each load of geopolymer concrete supplied, the Contractor must supply an identification certificate in accordance with AS 1379 Specification and supply of concrete, as part of the Quality Management Records. The certificate must identify the mix as geopolymer concrete.
- g) The Contractor must ensure that project assessment reports are available in accordance with AS 1379 Specification and supply of concrete, as part of the Quality Management Records. The reports must identify the mix as geopolymer concrete.

4 Concrete placement

- a) Geopolymer concrete must be transported, handled, placed, compacted, finished, and cured in accordance with the manufacturer's instructions and AS 3600 Concrete structures, using the recommended processes described in T41 Guide to Concrete Construction. Hand mixing is not permitted.
- b) Subject to the manufacturer's approval and provided a means of accurately measuring the volume of water is available, water may be added to the freshly mixed geopolymer concrete prior to commencement of discharge.
- c) The volume of any water added on Site must be recorded and provided as part of the Quality Management Records.
- d) Water must not be added after commencement of discharge of geopolymer concrete, unless expressly approved by the manufacturer.
- e) Prior to the discharge of geopolymer concrete at the Site, the mixer or agitator must be operated at mixing speed for not less than 3 minutes, until the geopolymer concrete becomes uniform. Geopolymer concrete which has begun to stiffen must not be used for the Works or Temporary Works.
- f) Geopolymer concrete at the acceptance point must have a temperature not less than 5°C nor greater than 35°C in accordance with AS 1379 Specification and supply of concrete. Concreting in the open must not be carried out during adverse conditions, such as rain, wind, dust, or bushfires in the immediate vicinity of the Site.

5 Hold Points

Table ST-SC-C7 5-1 details the review period or notification period, and type (documentation or construction quality) for each Hold Point referred to in this Master Specification Part.

Table ST-SC-C7 5-1 Hold Points

Section reference	Hold Point	Documentation or construction quality	Review period or notification period
3a)	Request to use geopolymer concrete	Documentation	10 Business Days review

6 Verification requirements and records

The Contractor must supply written verification as part of the Quality Management Records that the requirements listed in Table ST-SC-S2 6-1 been complied with.

Table ST-SC-S2 6-1 Verification records

Section reference	Subject	Record to be provided
3f)	Concrete identification certificates	Identification certificates in accordance with AS 1379 Specification and supply of concrete
3g)	Concrete project assessment reports	Concrete project assessment reports in accordance with AS 1379 Specification and supply of concrete