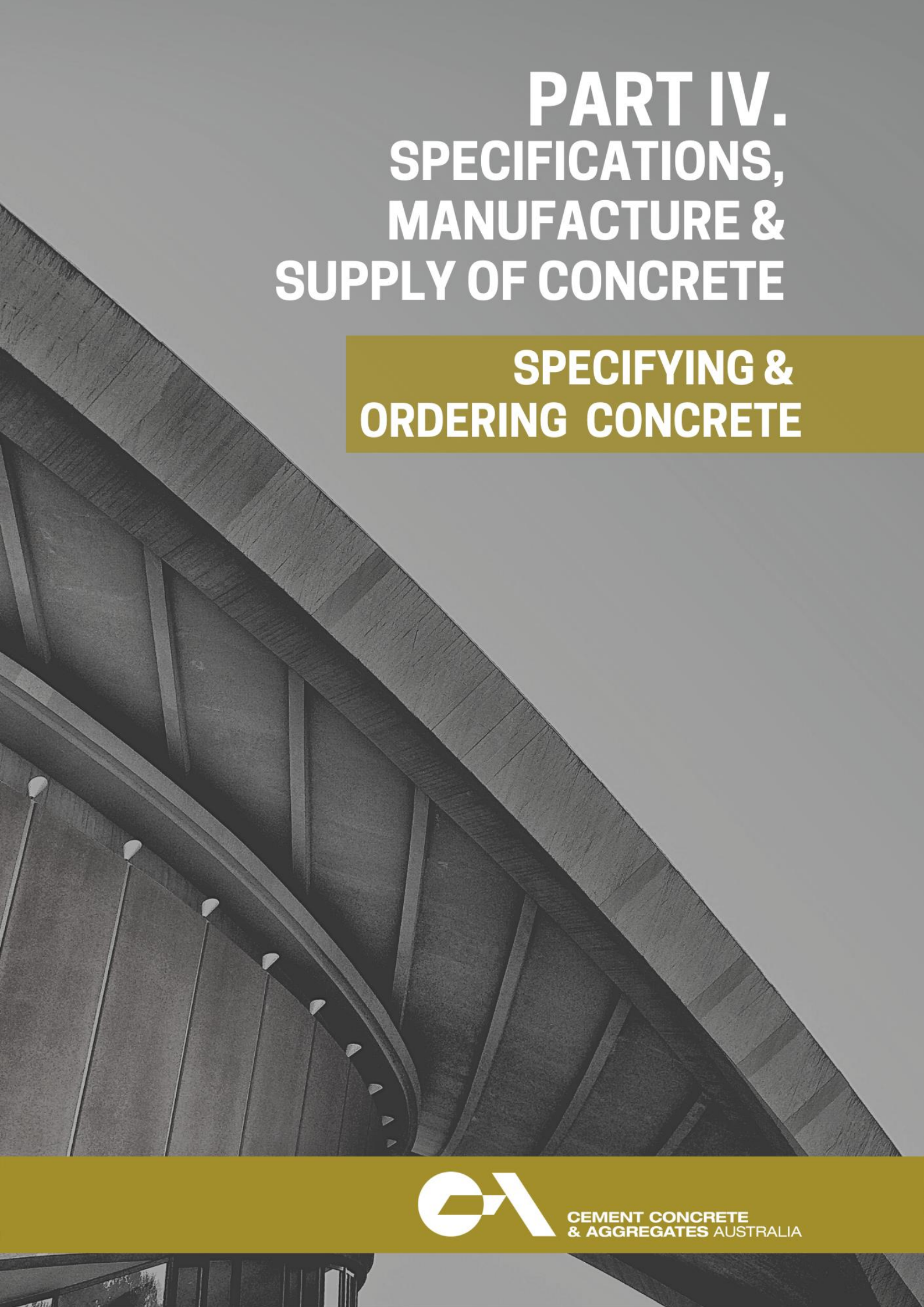
PART IV.
SPECIFICATIONS, MANUFACTURE & SUPPLY OF CONCRETE

SPECIFYING & ORDERING CONCRETE



CEMENT CONCRETE & AGGREGATES AUSTRALIA

CONTENTS

1. OUTLINE

This section deals with the issues that need to be addressed when specifying concrete for a project and when ordering concrete for supply to the construction site.

AS 1379 *'Specification and supply of concrete'* covers the supply of all concrete including site-mixed, factory-mixed, and truck-mixed concrete. In addition to specifying requirements for concrete materials, plant and equipment, the Standard sets out procedures for the specification and ordering of concrete, its production and delivery, and its sampling and testing for compliance with the requirements of the specification.

This section comments on general matters regarding specifications and the procedures for specifying concrete in the Standard. The principles governing specification aim to ensure the supply of a material that meets, consistently and uniformly, the parameters for the concrete assumed in the design in terms of strength, serviceability and durability. The provisions in the Standard for ordering concrete are also covered.

2. SPECIFYING CONCRETE

2.1 GENERAL

The general principles for specifying concrete are the same as those for any other material. The specifications along with the plans are the mediums by which the designer's intentions for the project are communicated to the contractor. While they also function as legal documents setting out the requirements to be fulfilled by the parties to the contract, this should not override or obscure the primary function of communication.

The requirements in both documents should be consistent, clear and unambiguous. Above all they should be consistent (e.g. using the one terminology for the same parameter every time it is used). A variety of arrangements is possible for the production and delivery of concrete to construction sites. To help achieve some uniformity, efficiency and economy in the production and delivery of concrete, AS 1379 sets out a number of standard ways in which concrete may be specified and ordered in accordance with that Standard.

In essence, it provides for two classes of concrete:

- ***Normal Class***, which is intended to cover concrete which can be basically specified by standard strength grade, the specification and ordering of which has been simplified as far as practicable;
- ***Special Class***, which allows for the specifier to incorporate into the project specification any special requirements for concrete for all or part of the project.

Special-Class concrete will generally be more costly than Normal-Class concrete because of the additional requirements imposed on the manufacturer. Further, there will be additional cost incurred because of the additional testing required to demonstrate that the concrete meets the specified requirements.

Particular attention is drawn to the overall limitations on the acid soluble chloride ion and acid soluble sulfate ion contents of concrete. Derived from all sources, these must not exceed 0.8 kg/m^3 of concrete for chloride ion content, and 50 g/kg of cement for sulfate ion content, unless otherwise specified. Some specifications may allow a higher limit for acid-soluble chloride ion content where the concrete is not to be reinforced. AS 3600 *'Concrete structures'* and AS 1379, for example, allow 2.0 kg/m^3 of acid soluble chloride ion content for such applications.

A detailed proposal for a suggested model of a *'General Specification for Concrete Construction'* is provided in Part XI of this Guide.

2.2 NORMAL-CLASS CONCRETE

Normal-Class concrete is specified by reference to a number of basic parameters that describe the characteristics of concrete. They are:

- The strength grade (either N20, N25, N32, N40, or N50), or the corresponding characteristic strength (either 20, 25, 32, 40, or 50 MPa at 28 days);
- The slump required at the point of acceptance – either 20, 30, 40, 50, 60, 70, 80, 90, 100, 110 or 120 mm;
- The maximum nominal size of the aggregate, either 10, 14 or 20 mm (note the default value is 20 mm);
- The intended method of placement;
- If project assessment is required (note if not specified it is assumed it is not required); and
- The level of entrained air (if required).

Standardisation of strength grades enables more test results to be generated for each grade and this has benefits for improved quality control of all strength specified products. It also eliminates or reduces unnecessary and one-off mix designs.

Concrete specified as Normal Class also has a number of limitations imposed on it by AS 1379. These relate to the type and quality of materials which may be used, the mass per unit volume of the concrete, the acid-soluble chloride and sulfate content, shrinkage strain and mean compressive strength. These latter parameters cannot be nominated or varied by the specifier and the concrete still be called Normal Class.

Specifiers should be aware of the values imposed by AS 1379. If they need to vary or control any parameter apart from those in the list of basic parameters, then the concrete must be nominated as Special Class.

AS 1379 provides a specification for basic assessment of a supplier's product range. This, and limits on tested values, provides a basis for the concrete suppliers quality control system and is referred to as Production Assessment. Production Assessment is targeted at production of concrete and is not required to be carried out on any particular site (i.e. sampling locations are assumed to be random).

Project assessment is a quality audit procedure which determines whether the concrete supplied to a particular project complies with the requirements of the specification. If project assessment is to be carried out the results may be used as part of the Production Assessment if desired. In this context, it should be noted that a supplier is required, by requirements in AS 1379, to guarantee the performance of Normal-Class concrete in terms of the parameters specified in the purchase order and those set out in AS 1379. Note also that unless specified it will be assumed that project assessment is not required.

There are some additional requirements of Normal-Class concrete that are provided in AS 1379, namely:

- That the concrete compressive strength is assessed and must comply with the requirements set out for Production Assessment;
- That the concrete slump is delivered to site within an acceptable range of the target slump as indicated in AS 1379;
- That the drying shrinkage of the concrete production is assessed as required in AS 1379 and that the 56-day drying shrinkage of a product is less than 1,000 microstrain;
- That the mean 7-day strength of a concrete mix must exceed limits set out in AS 1379.

2.3 SPECIAL-CLASS CONCRETE

Simply, Special-Class concrete is any concrete which cannot be specified as Normal Class. Specifically, it is concrete which is specified either in some way other than that set out for Normal-Class concrete (e.g. by specifying a higher standard strength grade; imposing a limit on shrinkage of 600 microstrain or imposing a

limit on the range for density), or where the purchaser wishes to vary or add other requirements to those set out for Normal Class, (e.g. specifying a value for slump of 45 mm; specifying a specific aggregate to achieve a required colour; specifying a non-standard or early-age strength requirement; or specifying a maximum water/cement ratio).

The standard strength grades outlined in AS 1379 and AS 3600 should be noted here. They can be either of 20, 25, 32, 40, 50, 65, 80 or 100 MPa at 28 days. It should also be noted that standard strength grades of 65 MPa or higher are automatically deemed to be Special-Class concrete and that strength grades of 80 MPa or higher may not be available from all concrete plants due to special aggregate, admixture and binder needs in some cases.

In addition to strength requirements there are also potential exposure classification durability classes required by AS 3600 that dictate a Special-Class concrete. This results from the special aggregate requirements for concrete used in exposure class B2, C1, C2 and U as detailed in AS 2758.1 and means that both 40 MPa and 50 MPa characteristic strength concrete may need to be deemed as Special Class when exposed to these environments (typically in near coastal, marine and other aggressive environments).

Special-Class concrete may be specified in one of two ways – as a Special-Class performance concrete or as a Special-Class prescription concrete. In the former case, the physical parameters or criteria specified may be those discussed in AS 1379 or may be some other physical parameters. In the case of Special-Class prescription concrete, the specifier is required to set out the proportions of materials they want and any limitations on those materials.

In either case, the specifier should set out in the specification how the properties are to be measured and give criteria for compliance with the specification. Appendix B of AS 1379 gives guidance on specifying Special-Class concrete.

It should be clearly understood that, under AS 1379 provisions, a supplier is freed of the obligation to guarantee the physical properties of the concrete if it is specified by proportions. In this instance (i.e. Special-Class prescription concrete), the supplier is required to warrant only that the specified prescription has been met.

3 ORDERING CONCRETE

3.1 GENERAL

It is most important when concrete is being ordered from an external supplier that the supplier is made fully aware of all the requirements specified for the concrete in the project specification.

It is first necessary to advise the supplier if the concrete is either 'Normal Class' or 'Special Class'. This should be stated in the contract documents (e.g. plans and specifications) and depends on whether the specification for the concrete contains requirements other than those permitted by AS 1379 for Normal-Class concrete. If the concrete is Normal Class, then AS 1379 sets out a series of parameters that have to be specified by the customer:

- A standard strength grade;
- The slump at the point of acceptance;
- The maximum nominal size of aggregate;
- The intended method of placement;
- Whether or not project assessment is required to be carried out by the supplier;
- If required, a level of air entrainment.

Values for each of these parameters will be set out in the project specification. If there is any doubt about any of them, the specifying authority should be consulted. It is important that the quality of the concrete matches that assumed in the design otherwise there may be a deficiency in strength or durability performance.

In this context, it should be noted that a supplier is required, by AS 1379, to guarantee the performance of Normal-Class concrete in terms of the parameters specified in the purchase order and those set out in the Standard. Note also that unless specified it will be assumed that project assessment is not required.

When Special-Class performance concrete is specified, the order should include all the

requirements set out in the project specification for the concrete. In accepting the order, the supplier guarantees the concrete in terms of the physical parameters which have been specified, and, if appropriate, the criteria for compliance. It is particularly important that there be no misunderstanding at this point. AS 1379 sets out criteria for judging compliance and, if these are to be varied or over-ruled, it is important that this be clearly understood.

The order should also include the following information:

- The name of the project;
- The address and details of the delivery location, including any restrictions that may apply (e.g. traffic and time of working);
- The volume of the total order;
- The time for the delivery of the first batch and the rate of delivery;
- The name and contact details of the person responsible for the concrete at the site and a contact who should be advised if there are any problems with delivery.

Similarly, it should be clearly understood that, under AS 1379 provisions, a supplier is freed of the obligation to guarantee the physical properties of the concrete if it is specified by proportions. In this instance (i.e. Special-Class prescription concrete) the supplier is required to guarantee only that the specified prescription has been met.

It is important, therefore, when preliminary enquiries are being made with a supplier, to indicate whether Normal or Special-Class concrete will be required. The latter is almost invariably more costly than the former, for equivalent strength grades, because of the additional requirements imposed on the manufacturer.

Ordering procedures are very much standardised. However, it is still possible for mistakes to be made if the clear difference between Normal and Special-Class concrete is not recognised at that point.

4 REFERENCES

1) AS 1379 – *Specification and supply of concrete* (R2017)
2) AS 3600 – *Concrete structures* (2018)
3) AS 1012 – *Methods of testing concrete*
4) AS 3972 – *General purpose and blended cements*
5) AS 2758.1 – *Aggregates and rock for engineering purposes – Concrete aggregates*
6) AS 3582.1 – *Supplementary cementitious materials, Part 1: Fly ash*
7) AS 3582.2 – *Supplementary cementitious materials, Part 2: Slag – Ground granulated iron blast-furnace*
8) AS 3582.3 – *Supplementary cementitious materials, Part 3: Amorphous silica*
9) AS 1478.1 – *Chemical admixtures for concrete*

CCAA OFFICES

NATIONAL OFFICE (NSW)
Level 10
163 -175 O'Riordan Street
Mascot NSW 2020

POSTAL ADDRESS
PO Box 124
Mascot NSW 1460
Telephone: (02) 9667 8300

QUEENSLAND
Level 14, 300 Ann Street,
Brisbane QLD 4000
Telephone: (07) 3227 5200

VICTORIA
Suite 910/1 Queens Road
Melbourne VIC 3004
Telephone: (03) 9825 0200

WESTERN AUSTRALIA
45 Ventnor Avenue
West Perth WA 6005
Telephone: (08) 9389 4452

SOUTH AUSTRALIA
Level 30, Westpac House
91 King William Street
Adelaide SA 5000
Telephone: (02) 9667 8300

TASMANIA
PO Box 1441
Lindisfarne TAS 7015
Telephone: (03) 6491 2529

ONLINE DETAILS
www.ccaa.com.au
Email: info@ccaa.com.au