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2024/02/06	T01	ISSUED FOR TENDER PURPOSES	RM
DATE.	REV NO	DESCRIPTION	BY

PROJECT INFO

CLIENT	DEVELOPMENT BANK OF SOUTH AFRICA		
PROJECT	CONSTRUCTION OF DIKIDIKINI BRIDGE		
DRAWING TITLE	CONCRETE SPECIFICATION		
FUNCTION	NAME	SIGNATURE	SHEET SIZE
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APPROVAL CONSULTANT

NAME	R McSPORRAN	PR. ENG.	SIGNATURE	AS PER SCHEDULE	SHEET NUMBER
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P = PLANNING	T = TENDER	C = CONSTRUCTION
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PSG CONCRETE (STRUCTURAL) (SANS 1200 G)

PSG 1 SCOPE

This specification applies to all Structural concrete for bridge abutments and approach slabs.

PSG 2 INTERPRETATIONS

PSG 2.3 DEFINITIONS

Under (a) add:

*Constructional joint: a joint required on account of constraints or convenience in the method of construction and that is not a movement, contraction or expansion joint *.

PSG 2.4.2 STRENGTH CONCRETE

Concrete will be specified in terms of cube strength. The following strengths will be used on the project:

Element	Strength Designation	Maximum Water Binder ratio
Unreinforced blinding	20/19	N/A
Reinforced Abutment Bases	40/19	0.55
Reinforced Concrete	40/19	0.55
Abutments		

PSG 2.4.3 JOINTS

Notwithstanding clause 2.4.3 "designated joints" will only be joints that are shown on the drawings. Any other joints that are required by the Contractor as a result of his construction constraints or for any other reason, whether approved by the engineer or not, will not be considered to be designated joints as defined in clause 3.4.3 i.e. they will be considered to be "non-designated" joints.

PSG 3 MATERIALS

PSG 3.2 CEMENT

Where "blast furnace slag concrete" is specified on the drawings, or scheduled, blast furnace slag shall be a constituent of the concrete as specified in PSG 3.9.

The standard cement specifications SABS ENV 197-1 and -2: Common cements, and SABS ENV 413-1 and -2: Masonry cement will be applicable to this contract, and the descriptions and types of cements specified, will be based on the designations as defined in these specifications.

The following blends of cements must be used unless prior agreement in writing from the engineer is obtained.

CEM I or, CEM II A or B or CEM II A, or 70% CEM I + 30% FA, or 50% CEM I + 50% GGBS

Supply all cement and other approved binder constituents from the same sources for the duration of the Contract.

PSG 3.2.3 STORAGE

Add the following clause:

Cement and slagment shall be used in the order in which it is received.

Unless approved by civil Engineer, cement and slagment kept in storage for longer than 8 weeks shall not be used in the Works.

Any cement that contains lumps that cannot easily be crumbled to powder between the fingers, may not be used.

PSG 3.3 WATER

Contractor to be aware of the available water results, however it remains the Contractor's obligation to ensure that any water used in construction activities are to meet the requirements and specifications for the project.

The water used for the mixing of grout/concrete needs to meet the requirements of "BS EN1008:2002 - Mixing water for concrete — Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete".

Below highlights critical requirements that need to be adhered to, noting that all requirements of BS EN1008:2002 need to be adhered to and that shall take precedence.

4.2 Preliminary Assessment

	Description	Requirement	Test Procedure
1	Oils and Fats	Not more than visible traces	In accordance with 6.1.1 of BS EN1008:2002
2	Detergents	Any foam should disappear within 2 minutes.	In accordance with 6.1.1 of BS EN1008:2002
3	Colour	Water not from sources classified in 3.2: The colour shall be assessed qualitatively as pale yellow or paler.	In accordance with 6.1.1 of BS EN1008:2002
4	Suspended Matter	Water recovered from processes in the concrete industry	Section A.4 of BS EN1008:2002
		Water from other sources – including underground or waterways –	In accordance with 6.1.1 of BS EN1008:2002

		Maximum 4ml sediment per 100ml.	
5	Odour	<p>Water recovered from process in the concrete industry.</p> <p>No smell, except the odour allowed for potable water and a slight smell of cement and where blastfurnace slag is present in the water, a slight smell of hydrogen sulphide.</p>	In accordance with 6.1.1 of BS EN1008:2002
		<p>Water from other sources. No smell, except the odour allowed for potable water. No smell of hydrogen sulphide after addition of hydrochloric acid.</p>	In accordance with 6.1.1 of BS EN1008:2002
6	Acids	pH ≤ 4	In accordance with 6.1.1 of BS EN1008:2002

7	Humic Matter	The colour shall be assessed qualitatively as yellowish brown or paler, after addition of NaOH.	In accordance with 6.1.1 of BS EN1008:2002
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The following chemical properties of the mixing water need to be adhered to:

4.3.1 Chlorides

The maximum chloride content within the water must be limited to 500mg/l

4.3.2 Sulphates

The maximum sulphate content shall be limited to 1000mg/l tested in accordance with section 6.1.3 of BS EN 1008:2002 and EN 196-2.

4.3.3 Alkali

The equivalent sodium oxide content of the water shall not normally exceed 1 500 mg/l tested in accordance with BS EN 1008:2002 and EN 196-21.

4.3.4 Harmful contamination

In the first instance qualitative tests for sugars, phosphates, nitrates, lead and zinc may be carried out. If the qualitative tests show a positive result, either the quantity of the substance concerned shall be determined or tests for setting time and compressive strength shall be performed.

Limiting requirements for of harmful substances

Substance	Maximum Content (mg/l)	Test Procedure
Sugars	100	In accordance with 6.1.3 of BS EN1008:2002
Phosphates; expressed as P2O5	100	In accordance with 6.1.3 of BS EN1008:2002
Nitrates; expressed as NO3	500	ISO 7890-1
Lead; expressed as Pb2+	100	In accordance with 6.1.3 of BS EN1008:2002
Zinc; expressed as Zn2+	100	In accordance with 6.1.3 of BS EN1008:2002

4.4 Setting time and strength

When tested in accordance with 6.1.4 the initial setting time obtained on specimens made with the water shall be not less than 1 hour and not differ by more than 25 % from the initial setting time obtained on specimens made with distilled or de-ionised water. The final setting time shall not exceed 12 hours and not differ by more than 25 % from the final setting time obtained on specimens made with distilled or de-ionised water.

The mean compressive strength at 7 days of the concrete or mortar specimens, prepared with the water, shall be at least 90 % of the mean compressive strength of corresponding specimens prepared with distilled or de-ionised water.

PSG 3.4 AGGREGATES

The nominal stone size specified in the concrete grade (e.g. 40,mm) shall mean stone conforming to the grading specified in SABS 1083 for the nearest equivalent size, i.e. 40 mm means stone that complies with SABS 1083 for 37,5 mm size.

PSG 3.4.2 USE OF PLUMS

The use of plums will not be permitted in structural concrete.

PSG 3.4.4 FINE AGGREGATE *

Fine aggregate must be clean naturally occurring siliceous sand. The broken shell content must not exceed 5% by mass tested in accordance with SANS 5831:2006.

Grading:

The following grading limits are required for the fine aggregate to be used:

Sieve Size mm	Cumulative percentage passing by mass
4.75	90-100
2.36	75-100
0.18	60-90
0.60	40-60
0.30	20-40
0.15	10-20
0.075	Natural sand – 5-10% and 5-20% for crushed sand

Dust content:

The material passing a 75- μ m sieve shall not exceed 5% (10% when the aggregate is derived from the mechanical crushing or milling rock) by mass.

Fineness modulus:

FM range for fine aggregate shall fall within the range 1.7 to 2.8. Where the FM is specified by the purchaser, the actual value shall not differ from the specified value by more than 0.1.

Chloride Content

The chloride content of the fine aggregate expressed as a per cent by mass shall not exceed 0.03%, tested in accordance with SANS test method 202:2006.

Soluble Deleterious impurities in Fine Aggregate

The sand shall contain no soluble deleterious impurities tested in accordance with SANS test method SANS 5834:2006

PSG 3.4.5 CONCRETE USING REACTIVE AGGREGATES *

The Contractor shall provide the Engineer with sufficient data to enable him to assess the degree of alkali-aggregate reactivity of the aggregates to be used for concrete.

Where reactive aggregates such as Malmesbury Group aggregates, and certain Table Mountain Formation and other quartzitic aggregates are used for concrete, the Contractor shall, in order to ensure that the concrete is not subject to alkali-aggregate reaction, design his mixes and/or use cement with a sufficiently low alkali content such that the total equivalent sodium oxide content of the cement is less than 1, 8 kg/m³.

(NOTE: The equivalent sodium oxide content (alkali content) is measured as (Na₂O + 0,658 K₂O). For cement it is expressed as a percentage to be adopted.

PSG 3.4.6 COURSE AGGREGATE

Grading:

The following grading limits are required to be adhered to for the course aggregate used:

Nominal Aperture size of sieve, mm	Nominal size of aggregate, mm	
	26.5	19.0

75		
53		
37.5	100	
26.5	85-100	100
19	0-50	85-100
13.2	0-25	0-50
9.5	0-5	0-25
6.7		0-5
4.75		
Dust Content	Not to Exceed 2%	

10% FACT value:

The minus -13.2-mm-plus-9.5-mm fraction shall be tested for the 10% fines aggregate crushing value. (i.e. The load required to produce 10% of fines). The loads in kN shall not be less than the following:

Stone for concrete subject to abrasion : Dry value: 110

Stone for concrete not subject to abrasion : Dry value: 70

Flakiness index:

As defined under SANS1083:2006, flakiness index must not be more than maximum value of 30% in the case of 26,5 mm aggregate size and 25% in the case of 19,0 mm aggregate size respectively.

Absorptivity:

The maximum water absorption of the coarse aggregate shall not exceed 0.5% by mass as defined under SABS1083:1994.

PSG 3.4.8 SAMPLE

At least one month before commencement of concrete work the Contractor shall supply at his own cost representative samples to the Engineer of the

aggregates he intends using, together with certificates from an approved laboratory indicating that the aggregates comply with the specifications. Approximately 50 kg of each sample of aggregate shall be supplied.

After approval these samples shall be taken as standard for the agreed aggregates to be used in the Works. If at any time during the course of the Contract the Engineer considers that there has been any deviation from the approved standard the Contractor shall submit further tested samples of material to the civil Engineer for approval.

PSG 3.5.1 ADMIXTURES

The use of admixtures will be subject to the approval of the Engineer. The information listed in Clause 3.5.1 shall be provided.

PSG 3.5.2 Air-entraining Agents

The use of air-entraining agents will not be permitted.

PSG 3.6 Reinforcement

All reinforcement at the time of placing of concrete shall be free from rust, scale, oil and other coating that may reduce the bond between steel and surrounding concrete, or initiate corrosion of the reinforcement.

The following strengths rebar have been specified for the project.

High yield strength: $f_y = 450 \text{ MPa}$

Mild steel: $f_y = 250 \text{ MPa}$

PSG 3.9 CEMENTITIOUS MATERIAL FOR BLAST FURNACE SLAG CONCRETE *

The cementitious material for blast furnace slag concrete shall consist of not less than 50% by mass of Portland cement complying with SABS 471 and not more than 50% by mass of milled granulated blast furnace slag. The ratio of blast furnace slag to cement may be varied by the Engineer before or during the Contract.

Blast furnace slag shall be milled; granulated blast-furnace slag processed from an approved source and should be of a consistent quality. It shall be ground to a minimum fineness of 3 500. Blaine (square centimetre per gram). The percentage by mass retained on an 88 micrometre screen shall not exceed 10%.

The blast furnace slag and the ordinary Portland cement shall be added separately at the mixer where they shall be intimately mixed.

PSG 4.2 BATCHING PLANT

Add:

Stand-by mixers of adequate capacity and with independent power supply shall be maintained on site for immediate use in the event of breakdown of the regular mixer/s or failure of the power supply.

PSG 4.4 MIXING PLANT AND VIBRATORS

Add:

Stand-by vibrators of adequate capacity and with an independent power unit shall be maintained on site for immediate use in the event of breakdown of the regular vibrators or failure of the power supply.

PSG 4.5.3 Formwork ties

Ties, when cast in, shall have some form of positive anchorage to prevent any rotation when loosening formwork.

PSG 4.5.4 Formwork: chamfers and fillets*

All exposed external angles in concrete work shall have 20 mm x 20 mm chamfers unless otherwise specified or ordered, but the top edge of a slab that is to receive and applied finish shall not be chamfered.

Internal corners in concrete work need not have fillets unless such fillets have been specified on the drawings or ordered by the Engineer.

PSG 4.6 WATER-BATH *

A temperature-controlled water-bath with a capacity to cure 75 cubes shall be provided on site. The water-bath shall be located under cover.

PSG 5 CONSTRUCTION

PSG 5.1 REINFORCEMENT

PSG 5.1.2 Fixing

Fixing of reinforcing bars by welding will not be permitted without the prior approval of the Engineer. Where welding is approved the methods used shall be subject to the Engineer's approval. Where called for, samples of typical reinforcement to be welded will be sent to a laboratory, designated by the

Engineer, for testing purposes. Under these circumstances the welding of samples shall be carried out on the site by the welder to be subsequently employed on the job, and carried out under the conditions which will prevail during the actual site welding. Where welding is permitted by the Engineer it shall be carried out in strict accordance with the relevant and SABS Codes of Practice.

PSG 5.1.3 Cover

In Clause 5.1.3(a) amend the words "bar or stirrup" to read: "bar, secondary reinforcement, tie, stirrup, tying-wire knots or wire ends".

Add to Clause 5.1.3: "Tying wire may not encroach on the specified minimum cover by more than a single strand thickness".

The specified concrete cover shall be deemed to apply to main reinforcement bars, secondary reinforcement, tie stirrups, tying-wire knots and wire ends.

Minimum concrete cover to any reinforcing bar, including links, to be generally as tabulated below, however the cover requirements indicated on the bending schedules to take precedence.

Element	Minimum Cover to Reinforcement
Reinforced Bridge Pier Foundations	50mm
Bridge Piers	50mm

PSG 5.1.3.1 Spacers *

Spacers shall be purpose made precast **mortar blocks**.

The mortar blocks shall be properly shaped so as not to slip out of position and shall be made of the same mix as the mortar of the concrete in which they are to be placed. The mortar shall be well compacted by approved means into the moulds to result in blocks with a density of at least 2 400 kg/m³ and which are free from honeycombing. The mortar blocks shall be cured in water for at least 7 days. Blocks which have not been manufactured and cured strictly in accordance with these requirements or which are in any other way considered unsatisfactory by the Engineer, will be rejected and shall be removed from the Site.

PSG 5.1.4 Splicing

Add:

Splice lengths for reinforcement shall not be less than 50 times the bar diameter unless indicated otherwise on the drawings or bending schedules.

PSG 5.2 FORMWORK

PSG 5.2.1 Classification of Finishes

Formwork for formed concrete surfaces against which backfill will be placed shall be rough. Formwork for all other formed surfaces shall be smooth, except where otherwise specified.

All Smooth formwork is to be degree accuracy I and not II as detailed in SABS 1200 – G

PSG 5.2.5.2 Removal of Formwork for Blast Furnace Slag Concrete

Add:

The requirements specified in Clause 5.2.5.2 will apply as a minimum. Prior to the removal of any formwork approval shall be obtained from the engineer.

PGS 5.5 CONCRETE

PSG 5.5.5.1 General

The concrete mix design for strength concrete must be prepared in an approved laboratory and the results of actual test mixes must be submitted for approval together with 7-day and 28-day strength test results. Special attention is drawn to the fact that the concrete mix must provide a very dense and impervious concrete.

No concrete shall be cast until the mix designs have been approved by the civil Engineer: The Civil Engineer may call for revised mix designs at any stage during the Contract.

PSG 5.5.1.4 Chloride Content

The maximum chloride (as Cl, % (m/m)) in the concrete shall not exceed 0.20%.

The content of chloride ion in the aggregates shall be determined and shall be within the limits specified in SABS 1083. Test results shall be submitted to the Engineer.

Chloride content of fine aggregate expressed as per cent by mass of Cl⁻ shall not exceed the following limits:

Sand for normal reinforced concrete 0.3

PSG 5.5.1.7 Strength Concrete

With the exception of mixes weaker than 15 MPa, all concrete for the Works shall be considered to be strength concrete in terms of Clause 5.5.1.7

The engineer will specify the grade of the concrete and the position in the works, it will remain the responsibility of the contractor to ensure that the specified performance of the concrete is attained, notwithstanding the requirements of this document.

Blinding

Provide a minimum 50mm unreinforced concrete blinding under all bases or greater if directed on the construction drawings.

PSG 5.5.2 Batching

Batching of strength concrete shall be by mass.

PSG 5.5.3.1 Mixing of Concrete at Construction Site

Add:

Where mixing of concrete is undertaken at the construction site the contractor shall ensure that the mixing plant is contained within a self contained facility that will meet all legislative requirements of the Republic of South Africa. It shall as a minimum ensure that the concrete is mixed within a self contained bunded area from which no material will be able to discharge into adjacent water courses, surrounding subsoils, or surrounding environment. All waste material including - waste water, hardened waste concrete, mortar or any material be it waste or required for the production of concrete is retained on the site. All waste material and material used in the production of concrete (that is not formed into the permanent works) needs to be removed from site and disposed at an approved dump site.

PSG 5.5.3.2 Ready-mixed concrete

Concrete form a central Concrete production facility other than on the construction site will be permitted and, apart from test results in terms of 7.3.1, 7.3.2 and / or 7.3.3, test results obtained by such a production facility as part of its quality control system will be accepted for evaluation in terms of Clause 7.3.4, provided they are stored and cured on site.

PSG 5.5.5.10 Prevention and Repair of Plastic Shrinkage Cracks*

The Contactor shall take whatever measures are necessary to prevent plastic shrinkage cracking in the concrete. Particularly on dry windy days or hot sunny days the Contractor shall make provision for fine spraying of the concrete surface with water within one hour of casting or covering of the concrete with black plastic sheeting it may be necessary to change the aggregates or the concrete mix proportions. In order to combat shrinkage cracking it may also be necessary to change the time at, or the manner in which, power floating is carried out.

PSG 5.5.7 Construction Joints

Unless construction joints between designated joints shown on the drawings are authorized by the Engineer in writing, concrete shall be cast continuously between the designated joints shown on the drawings.

PSG 5.5.7.4 Formed Joints *

Formed joints will be considered to be designated joints as defined in Clause 2.4.3

Each joint shall be formed as shown on the drawings, complete with shear key rebates, waffle formwork, B-feature, waterstops, "Flexcell" or similar joint filler, dowel bars and their PVC tubes, etc, as indicated.

PSG 5.5.8 Curing and Protection

PSG 5.5.8.1 Horizontal surfaces *

Horizontal and near horizontal surfaces shall be wet cured for a minimum of seven days from date of casting, and treated in accordance with Clause 5.5.8

Other surfaces of the concrete shall be treated with a curing compound complying with PSG 5.5.8.3

PSG 5.5.8.2 Formed surfaces *

In order to improve the effectiveness of the curing treatment, the specified minimum time for the removal of the formwork shall be four days

PSG 5.5.8.3 Curing compound *

The use of membrane curing compounds will be allowed on vertical faces or steeply inclined faces (i.e. steeper than 45° to the horizontal) of cast in situ members of the structures subject to the Contractor producing sufficient, satisfactory cube crushing strength test results where the crushing strength of cubes which have been cured with the proposed during membrane and left exposed to the elements are compared with those of an equal number of water cured cubes. The crushing strength of cubes cured with the proposed membrane shall be at least 82% of the crushing strength of the water cured cubes.

Before any membrane curing compound is used, each batch should be tested on a trial surface to ensure that it forms a satisfactory membrane, and any compound which is unsatisfactory in the opinion of the Engineer, shall be rejected. Curing membranes will be disallowed if permanent discolouration of the concrete takes place. Surfaces where curing membranes are used shall be treated in such a manner that the final concrete texture and colour blends in with the rest of the concrete work. Furthermore, the Engineer shall, at his discretion require the Contractor immediately to adopt an effective alternative means of curing any area of the structure to which a membrane has been applied which in the opinion of the Engineer, is unsatisfactory. The curing compound used shall be to the approval of the Engineer. Wax based curing compounds will not be permitted.

The curing compound shall be applied immediately as formwork is progressively stripped or, in the case of unformed surfaces, when the concrete has taken its initial set. It shall preferably be applied by spraying and the rate of application shall be strictly in accordance with the manufacturer's recommendations. A method of monitoring the area to which curing compound has been applied and the application rate shall be as approved by the Engineer and rigidly applied by the Contractor.

Surfaces of joint rebates, where elastomeric sealant is to be applied, shall be protected from contamination by curing compound by the use of masking tape.

PSG 5.5.9.2 Hot Weather Conditions

No placing of concrete shall take place if the ambient temperature exceeds 32°C, or is likely to rise above 32°C during the casting period or within eight hours after casting is completed.

PSG 5.5.10 Concrete Surfaces

PSG 5.5.10.4 Screeded Finishes *

After placing and compacting, the concrete on a top (unformed) surface shall be struck off with a template to the designated grades and tamped with a tamping board to compact the surface thoroughly and to bring mortar to the surface, leaving the surface slightly ridged but generally at the required elevation. No mortar shall be added and noticeable surface irregularities caused by the displacement of coarse aggregate shall be made good by re-screeding after the interfering aggregate shall have been removed or tamped.

PSG 5.5.10.5 Wood-floated Finish *

Where wood-floating is ordered or scheduled, the surface shall first be given a finish specified in PSG 5.5.10.4 Clause 5.5.10.1 and, after the concrete has hardened sufficiently, it shall be wood-floated, either by hand or machine, only sufficiently to produce a uniform surface free from screeding marks.

PSG 5.5.10.6 Steel-floated Finish *

Where steel-floating is ordered or scheduled, the surface shall first be given a finish specified in PSG 5.5.10.4 except that, when the moisture film has disappeared and the Where wood-floating is ordered or scheduled, the surface shall first be given a finish specified has hardened sufficiently to prevent laitance from being worked to the surface, the screeded surface shall be steel-trowelled under firm pressure to produce a dense, smooth, uniform surface free from trowel marks.

PSG 5.5.10.7 Power Floated Finish

After initial finishing the levelled concrete surface shall be power floated to provide a dense surface.

After the bleed water has disappeared and the concrete has hardened sufficiently the float blades shall be replaced with trowel blades.

The surface will be power trowelled with at least a double pass to provide a dense, smooth uniform surface free from irregularities.

PSG 5.5.10.10 Power Trowelled Finish

In addition to the procedure for the power floated floor the surface shall be continually burnished to provide a dense, smooth, high quality polished surface free from any irregularities.

PSG 5.5.10.11 Project Specific Finishes

The following project specific finishes are to be implemented on the project.

All approach roads – Power floated finish

Top of bridge piers – Steel floated finish

PSG 5.5.14 Defects

All defects shall be repaired as soon as possible after the formwork has been removed and the Engineer has inspected the concrete. A statement of the method to be used for each repair shall be submitted to the Engineer for his approval before any work is carried out. The Engineer may prohibit the further placing of concrete in the particular area concerned until he is satisfied that the repair has been satisfactorily executed.

Complete repair work and apply the curing compound and curing membrane over repair areas within 24 hours of stripping formwork.

PSG 6 TOLERANCE

PSG 6.2.3 PERMISSIBLE DEVIATIONS

The permissible deviation for cover to reinforcement shall be –0, +10 mm.

Reinforcing: Degree of Accuracy Category II as per SABS 1200G.

Only a nominal reduction of the minimum specified cover by a single strand thickness will be allowed for binding wire.

Concrete finishes to be as detailed in section 6.2.3 of SABS 1200G, with the following degrees of accuracy required.

Concrete Element	Degree Accuracy
Below ground concrete	II
Above ground Concrete	I

Provide all exposed external corners of walls, beams, slabs or any other concrete elements not covered by backfill with 20 x 20 mm chamfers, or as detailed on the drawings.

PSG 7 TESTING

Make, cure and test all test cubes in accordance with the requirements of SABS methods 860:1994, 861-3:1994 and 863:1994

The slump of the concrete shall be tested in accordance with SABS Method 862-1:1994. If the slump needs to be measured, discharge 10% of the load before sampling concrete for the test. The load may be rejected if the slump is too high.

The Contractor is responsible to ensure that concrete testing is executed competently and accurately.

Concrete must be sampled from concrete being used for construction and in accordance with SABS Method 861-2:1994

Sampling to be taken from each days casting for each specific grade of concrete and from at least 30m³ of concrete for each grade placed.

Arrange the exact details of numbers of samples to be taken with the Engineer at commencement of construction. Make 150 x 150 x 150mm test cubes in all cases. Supply the necessary moulds and cubes under the supervision of the Engineer who has the right to reject any moulds which in his opinion will not give cubes which are true. Supply sufficient moulds to make the daily quota of cubes.

Make, cure and test all test cubes in accordance with the requirements of SABS methods 860:1994, 861-3:1994 and 863:1994

Cure test cubes in an approved curing tank provided (cubes cured under water at controlled temperatures) on the Site and deliver them to an independent laboratory as approved by the Engineer for testing not less than 24 hours in advance of the specified time for testing.

Subject to approval of each grade of strength concrete on this basis, concrete quality will be monitored for the balance of the Contract by statistical analyses carried out on the test results of concrete cubes for each grade of concrete according to the specified sampling range.

One sample shall consist of three concrete test cubes.

For each sample taken the position in the structure shall be recorded where the batch represented by that sample is placed.

Sampling of concrete of a particular grade shall be as specified in Clause 7.1.2.

PSG 7.1.2.2 TESTING

Delete: "At least one set of samples shall be taken from each day's casting and from at least every 50m³ of each concrete grade placed."

Add: "At least one set of samples shall be taken from each days casting and from at least every 20m³ of each concrete grade placed."