BRL 5070

01 Explanation to the Framework Schedule for Internal Quality Control

This document explains the IQC (internal quality control) schedule for BRL 5070 Precast Concrete Elements dated 16 April 2015 and describes how the requirements stated therein must be met.

This explanation provides a framework on how to follow-up on the IQC schedule (certificate holder) and assess its compliance (Kiwa).

The contents and structure of these instructions follow the IQC schedule for BRL 5070.

Laboratory and measuring equipment

General
Foreign calibration certificates are valid if they meet the requirements and standards of the Dutch calibration certificates.

Scales
The temporary use of third-party scales is only permitted if the certificate holder calibrates the scales at the production site.

Scale inaccuracy by +/- 1 gram means that a scale's scale divisions (accuracy) may not exceed 1 gram.

The allowable inaccuracy of the scale is ± 0.1% for a weight < 4 kg and ± 1.0 % for a weight ≥ 4 kg.

Control weights
The certificate holder may make its own steel weights to calibrate the dosing equipment. These weights must have a mass of multiples of 5 kg and must be marked. The certificate holder may calibrate these self-made weights with an accuracy of 0.5% using a test weight or a calibrated scale.

Dosing and mixing equipment

General
Manual dosing is only permitted if a calibrated scale or calibrated measuring barrel is used.

If, during calibration, one or more of the dosing units falls outside of the tolerances (for the area of activity), the unit will be adjusted and the calibration frequency increased in agreement with the certifying body.

Dosing units that also check the weight are equipped with load cells. When the weight is checked, a control or test weight is used to determine whether the weight on the digital display matches the weight measured by the load cell. These weight checks are equivalent to daily calibrations and can reduce the calibration frequency for the whole unit. These dosing units must be calibrated across the dosing range before they are put into operation. The daily weight checks must be documented. The whole unit must be calibrated across the dosing range once every two years.

Dosing unit for water
Manufacturers of surface materials are allowed to dose water based on resistance measurements. The resistance measurement does not have to be calibrated.

Incoming goods inspection

Table 1: Additional verification/inspection requirements by raw material

Raw material	KOMO/NL BSB/CE	BRL / Standard	Additional verifications/inspections
Fresh concrete	KOMO NL BSB	BRL 1801 BRL 9338	• If the maximum water/binding ratio > 0.55, additional tests/verifications must be agreed with the certifying body
Fresh concrete	N/A	Überwachung, Benor etc.	• IQC schedule BRL 5070, see explanation.
Cement	KOMO	BRL 2601	
Cement	CE AvcP 1^+	NEN-EN 197-1 (Annexe ZA)	• Inspection report based on NEN-EN 197-1 / NEN 3550 (1 x per quarter)
Aggregates	KOMO	BRL 2501/2502/9311/2506	

Natural aggregates for concrete	CE AvcP 2^+ and 4	NEN-EN 12620 (Annexe ZA)	• Self-analysis (for new supplier or product and not older than 1 year) [4]
			• DoP declared values (one-time for new supplier or product):
			  • Chloride content < 0.01%
			  • Acid-soluble sulphur: $AS_{0.2}$ or $AS_{0.8}$
			  • Total sulphur content: < 1%
			  • Released hazardous components[5]

Synthetic (lightweight) aggregates for concrete	CE AvcP 2^+ and 4	NEN-EN 12620 (Annexe ZA)
		NEN-EN 13055-1 (Annexe ZA)
			• Self-analysis (for new supplier or product and not older than 1 year) [4]
			• DoP declared values (one-time for new supplier or product):
			  • Chloride content < 0.01%
			  • In Acid-soluble sulphur:
			  - for air cooled blast furnace slag $AS_{1.0}$
			  - for other aggregates $AS_{0,2}$ of $AS_{0,8}$
			  • Total sulphur content:
			  - for air cooled blast furnace slag < 2%
			  - for other aggregates < 1%
			  • Released hazardous components[5]
			• Additional tests/verifications must be agreed with the certifying body[1]

Admixtures	KOMO	BRL 1803	
Admixtures[2]	CE AvcP 2^+ and 4	NEN-EN 934-2 (Annexe ZA)	• Inspection report for chloride-based catalysts (1x per quarter)[3]
Fillers type I - inert filler	KOMO	BRL 1804	

Natural fillers type I	CE AvcP 2^+ and 4	NEN-EN 12620 (Annexe ZA)	• DoP declared values (for new supplier or product and not older than 1 year):
			  • Chloride content < 0.01%
			  • Acid-soluble sulphur: $AS_{0.2}$ or $AS_{0.8}$
			  • Total sulphur content: < 1%
			  • Released hazardous components[5]

Synthetic fillers type I	CE AvcP 2^+ and 4	NEN-EN 12620 (Annexe ZA)	• DoP declared values (for new supplier or product and not older than 1 year):
			  • Chloride content < 0.01%
			  • In Acid-soluble sulphur:
			  - for air cooled blast furnace slag $AS_{1.0}$
			  - for other aggregates $AS_{0,2}$ of $AS_{0,8}$
			  • Total sulphur content:
			  - for air cooled blast furnace slag < 2%
			  - for other aggregates < 1%
			  • Released hazardous components[5]
			• Additional tests/verifications must be agreed with the certifying body[1]

Fillers type I (dyes)	CE AvcP 2^+	EN 12878 (Annexe ZA)	• Processing guideline
Fillers type II	KOMO	BRL 2505/ 9325	
Fillers type II	CE AoC 1^+	among others NEN-EN 13263 NEN-EN 450 (Annexe ZA),	• Inspection report (1 x per quarter)
Other raw materials	N/A		• Additional tests/verifications must be agreed with the certifying body[1]

[1] For these raw materials, the certificate holder must ask the Site assessor to assess whether the material falls within the concrete cluster and which potential additional verification requirements and/or tests the material must be subjected to. These additional requirements must be added to the list of agreements.

[2] Admixtures that are used in the earth-dry production of concrete do not have to have a CE mark. Otherwise, the same additional requirements apply as for admixtures that are not KOMO certified.

[3] When using chloride-based accelerators that only have a CE mark, the chloride content must be known and comply with NEN 3532.

[4] Self-analyses may also be provided by the supplier

[5] when required or when in doubt

Verification - General
Delivery documents, CE or KOMO certification documents and inspection reports must be in line with each other (name of certificate holder, manufacturing or mining area, valid certificate number).

Verification - Delivery documents
The manufacturer must have the documents for each raw material available for inspection. If the raw material is delivered under CE, the bill of delivery must contain a link to the FPC certificate (AvcP 1+ or 2+). The CE logo is sufficient for AvcP level 4.

Verification - KOMO certificate or product information sheet
For KOMO-certified raw materials, the manufacturer must have the latest KOMO certificate.
For CE-marked raw materials that are not KOMO certified, the manufacturer must have the latest Declaration of Performance (DoP).

The supplier must specify a product's limit values in the DoP. For certain admixtures and fillers, the supplier must put this information on the packaging (e.g. dyes).

Verification - Equivalence
If a material is not KOMO certified, the manufacturer must prove its equivalence by means of a CE mark and/or additional inspections. Table 1 contains the list of applicable raw materials and potential additional inspections under BRL 5070.

The inspections must be carried out by a laboratory that is accredited for the specific tests.

Foreign certifications such as Benor and Überwachung are not equivalent to KOMO certification because they do not meet Dutch regulations.

Transloading material
If material is transloaded, the accompanying delivery and certification documents and the product information sheet, which must specify the mining area, must be verified.

Fresh concrete
Next to the KOMO product certificates for fresh concrete there is also talk of NL BSB certificates for the Soil Quality Decree. This NL BSB certificate is based on the cluster issued by SCBB (Stichting voor de Beheer van het Cluster (Foundation for Cluster Management).

In foreign countries, fresh concrete can come from an external ready-mixed concrete plant. In most cases, the plant has a foreign quality declaration (Benor, Überwachung etc). The manufacturer must agree in writing with the ready-mixed concrete plant that the plant will carry out IQCs according to the IQC set out in BRL 5070. The manufacturer must agree (document) with the plant on the composition of the concrete for each order, meaning that all of the raw materials must be specified with a reference to the relevant standards and assessment guidelines.

The external ready-mixed concrete plant is considered to be part of the manufacturer's production process and must therefore be audited as if it were an own ready-mixed concrete plant. The ready-mixed concrete plant must also be audited during each visit.

Cement
For KOMO-certified cement products, the manufacturer must reapply for the KOMO certificate every year (in addition to requesting it from the new supplier or for a new product type).

If cement is delivered from a transloading hub, the transloading hub must be certified (CE and/or KOMO).

Aggregates
If the transloading hub is not CE or KOMO certified, it must be possible to derive the material and the CE/KOMO number of the mining area/production site from the delivery documents.

For own recycling material (recycled concrete aggregate) a visual inspection for contaminants must be carried out. If the material is not used at an own site, there must be at least a certificate for the own recycled concrete aggregate. In addition, a self-analysis must be carried out once a quarter (or once per crushing process if the crushing process is less frequent than once a quarter).

Fillers
In terms of fillers, we distinguish between type I and type II fillers. Type I fillers are inert and do not react in the concrete hydration process. Such fillers are limestone powder and dyes. Type II fillers, on the other hand, are part of the hydration process and have a binding function just like cement. Fly ash, silica fume and ground-granulated blast-furnace slag are type II fillers.

Concrete

Water/cement - water/binding ratio
According to the composition requirements in the cluster procedure for concrete (Annexe V to BRL 5070), the limits for the cement/WCR combinations are as follows:

- Cement ≤ 600 kg/m³ with a WCR ≤ 0.45;
- Cement ≤ 360 kg/m³ with a WCR ≤ 0.55;

The following cement quantities apply if the WCRs are interpolated between 0.45 and 0.55:

- WCR = 0.46: Cement ≤ 570 kg/m³;
- WCR = 0.47: Cement ≤ 552 kg/m³;
- WCR = 0.48: Cement ≤ 528 kg/m³;
- WCR = 0.49: Cement ≤ 504 kg/m³;
- WCR = 0.50: Cement ≤ 480 kg/m³;
- WCR = 0.51: Cement ≤ 456 kg/m³;
- WCR = 0.52: Cement ≤ 432 kg/m³;
- WCR = 0.53: Cement ≤ 408 kg/m³;
- WCR = 0.54: Cement ≤ 384 kg/m³;

All of these WCRs may be exceeded by the allowed deviation of 0.02.

The water cement/water binding ratio is determined according to NEN 5960. In deviation, the WCR/WBR for surface material may be determined as described in Annexe 1 'Determining the water/cement ratio when the amount of dosed water is unknown'.

If several compositions of concrete are produced in the same month, you can agree with the Site assessor to determine the water/cement ratio for the compositions that are the most critical for the water/cement ratio.

At the beginning of the certification agreement, the WCR/WBR must be determined once a month for the most critical compositions of concrete that a manufacturer produces in that month. For manufacturers of surface materials, the WCR must be determined once every three months. The latter frequency was determined because the WCR/WBR value for said materials is significantly lower than the maximum limit.

If, after one year, the real WCRs/WBRs are always at least 0.05 lower than the above stated maximum values, the manufacturer can agree with Kiwa to reduce the frequency to once every three months. Kiwa adds the frequency to the list of agreements or technical specifications. The frequency does not depend on the k-value, as stated in the IQC schedule of BRL 5070.

Composition of the mixture
The manufacturer must document the below information in writing for each composition of concrete:

- Date of issue;
- quantity [kg/m³] and type of cement;
- water/cement or water/binding ratio in accordance with NEN 5960;
- quantity [kg/m³] and type of course aggregates;
- quantity [kg/m³] and type of fine aggregates;
- quantity [kg/m³] and type of fillers;
- quantity and type of admixtures;
- quantity and type of dyes.

The Site assessor (randomly) checks whether the documented information about the composition is still correct.

Changes to the composition of the mixture must meet the composition requirements for participation in the concrete cluster (Annexe V to BRL 5070). When in doubt, contact Mr Meijnhardt (+31-(0)88 998 45 62) or Mr Van der Vegte (+31-(0)88 998 44 36).

If the changes do not meet the composition requirements for participation in the concrete cluster, a separate cluster can be set up with specific composition requirements. Please contact Kiwa for more information.

Finished product

Emissions and composition
As part of the approval and verification process, Kiwa tests and assesses both the emissions and the composition.

If the composition of the mixture changes, Kiwa checks whether it meets the afore-determined composition requirements (e.g. composition requirements for cluster concrete). When in doubt, Kiwa can decide to test and assess the new composition for emissions and composition.

Marks
Kiwa checks whether the specifications on the delivery documents and/or the packaging and/or the products are placed as described on the NL-BSB certificate.

For NL-BSB marks, the certificate holder can choose to mark the delivery documents and/or the packaging and/or the products. A blue seal with the NL-BSB mark and the K-number (available from Kiwa) can be used.

Delivery documents/products are marked with NL-BSB.

Annexe 1: Determining the water/cement ratio when the amount of dosed water is unknown

Required materials

- Scale with a maximum inaccuracy of 1 gram
- Steel curing box
- Curing oven or hot plate
- Steel strip/paddle mixer
- Fresh concrete sample of ca. 2000 gram (preferably from the cement mixer or from fresh product)

Known facts

- Document each of the dosed quantities of raw materials in the mixture in kg (wet).
- Document each of the dosed quantities of cement in the mixture in kg.

Execution

- Determine all of the weights to an accuracy of 1 gram.
- Determine the weight of the curing box (a).
- Place ca. 2000 gram of fresh concrete in the curing box. Determine the weight (b) of the curing box with the sample.
- Place the curing box on the hot plate or in the curing oven. Stir the sample regularly and cure the sample to a constant weight.
- A constant weight is reached when the last and second-to-last measured weights differ by a maximum of 5 gram. The concrete must cure for 30 minutes between two weight measurements.
- After 30 minutes, determine the weight (c) of the curing box with the dried sample.
- Determine the percentage of water in the dosed quantities of raw materials in the mixture in the same way.
- Calculate cumulative quantities of dosed raw materials in the mixture in kg (d).

Calculations

- Percentage of water (e) in fresh concrete: e = (b – c)/(b - a) x 100%
- Mixture size (f) including water in kg: f = d/(100-e) x 100%
- Amount of water (g) in mixture in kg: g = f - d
- Water/cement ratio: WCR= g/(dosed quantity of cement)

Explanation
When using porous materials, the amount of water that is absorbed by the porous aggregates must be deducted from the total amount of water (g).

Example

Known facts:	Wet mixture:	Specific percentage of water:	Dry mixture:
	Sand 1200 kg	4%	Sand 1152 kg
	Gravel 500 kg	2%	Gravel 490 kg
	Cement 300 kg		Cement 300 kg
	Total 2000 kg		Total 1942 kg (= d)

Percentage of water (e) in fresh concrete:	Weight of curing box	: 500 gram (a)
	Wet weight of fresh concrete incl. curing box	: 2500 gram (b)
	Dry weight of fresh concrete incl. curing box	: 2390 gram (c)
	e = (2500 – 2390)/(2500 - 500)x 100 = 5.5	
Mixture size (f) including water in kg:	f = 1942/(100-5.5)x100% f = 2055 kg	
Amount of water (g) in mixture in kg:	g = 2055-1942 g = 113 kg	
Water/cement ratio:	**WCR = 113/300 = 0.38**	