

REGULATION

amending for the twelfth time Building Regulation No 112/2012

1. Article 1

A new point, point h, is added to paragraph 1 of Article 2.3.6, as follows:

“A research mast intended for taking measurements, erected temporarily and for no longer than two years.”

Article 2

Chapter 8.3 and its heading will become as follows:

“CHAPTER 8.3. Concrete

Article 8.3.1.

Presentation of requirements.

With respect to those provisions of this section of the Regulation that are divided into principles and guidelines, principles are always mandatory while guidelines are non-mandatory when it is demonstrated that quality and safety are ensured equally by other means and the principle of the relevant provision is conformed to. In such cases, the structural designer shall submit, attached to the design documents, a memorandum where it is explained and reasoned in what manner the general principle of the provision is fulfilled and how quality and safety are ensured. Other provisions of this section of the Regulation are mandatory except as expressly provided for otherwise in the relevant provision.

Article 8.3.2.

Requirements for concrete.

The choice of composition materials for concrete and its formulation shall aim to ensure the durability of the concrete and minimize its environmental impact during the service time of the structure. Concrete and its composition materials shall conform to the provisions of the Construction Products Act, Icelandic prestandards for construction design and the ÍST EN 206, ÍST EN 13670 and ÍST 76 standards.

Article 8.3.3.

Concrete composition materials.

Principle: Cement, minerals, additives, admixtures and other composition materials that compose concrete shall not include materials that can be harmful to the durability of the concrete. The concrete shall be fit for its intended use.

Guidelines:

1. The mineral composition shall be such that concrete containing the mineral conforms to the requirements for the relevant exposure class.
2. For the use of recycled minerals, refer to the ÍST EN 206 standard. Concrete containing recycled minerals shall conform to the requirements for the relevant exposure class and shall additionally not have a damaging impact on alkali activity, shrinkage or other properties.

Article 8.3.4.

Alkali activity of minerals.

Minerals for making concrete shall be tested with a view to alkali activity regardless of whether they are natural, processed, recovered or recycled. They shall be considered to be inactive if the expansion is less than:

- a. 0.200% after 14 days according to the RILEM AAR-2 test method, using CEM I cement, or
- b. 0.040% after 12 months according to the RILEM AAR-3.1 test method, using CEM I cement and where the alkali ($\text{Na}_2\text{O}_{\text{eq}}$) content of the tested mixture is equivalent to 1.2 to 1.5% of the weight of the cement.

A mineral that passes testing according to method b shall be considered to be inactive even if it does not pass according to method a.

A mineral that is deemed to be active may be permitted if it conforms to the provision of Article 8.3.5.

The Housing and Construction Authority shall issue guidelines on the implementation of this provision.

Article 8.3.5.

Usage of alkali-active minerals.

The usage of active minerals and mixtures of active minerals shall be permitted if the expansion of mortar bars cast with the specific mixture of minerals, admixtures and cement intended for use, is less than 0.040% after 12 months, measured using the RILEM AAR-3.2 test method, if the alkali ($\text{Na}_2\text{O}_{\text{eq}}$) content of the concrete is increased by 40%.

If the concrete remains dry over its service time and dries out, e.g. in a heated indoor space, the usage of active aggregates is permissible even if they do not conform to the requirements of this Article.

By way of derogation from paragraphs 1 and 2, the use of active minerals under Article 8.3.4 is not permitted if the concrete is subjected to high temperatures and high humidity and/or direct salt effects.

Article 8.3.6.

Exposure classes and requirements for concrete.

Principle: The composition of concrete shall be chosen with the aim of ensuring its durability and minimizing its environmental impact over the service time of the structure.

Guideline: The following tables and descriptions contain criteria regarding requirements for concrete relating to exposure classes. As well as conforming to the requirements for the composition of concrete, structural designers shall submit the estimated carbon footprint of the intended concrete mixture.

The Housing and Construction Authority shall issue guidelines on the implementation of this provision.

		Rusting caused by carbonation				Freeze-thaw effect			
Exposure class		XC1	XC2	XC3	XC4	XÚ1	XÚ2	XÚ3	XÚ4
Description of the environment	Non-reinforced indoor concrete and reinforced concrete in conditions with very low relative humidity	Dry with low relative air humidity of 30–50%.	Wet and rarely dry. Relative air humidity over 85% or permanently saturated	Average relative air humidity: 65–85%	Concrete is alternatively wet or dry	No salt effects	Mostly free of salt effects Airborne salt	Severe weathering effects without salt	Severe weathering and salt effects
Examples of locations for environmental classes		The indoor area is heated and outside walls have wind-proof insulation and waterproof cladding	Concrete permanently under water	Inside areas of laundries and bathing facilities. Outside concrete, protected from rain	Concrete is given a long time to dry but then exposed to wetness	Outside walls of houses	Vertical, unprotected surfaces near the sea	Inclined and horizontal surfaces, e.g. outdoor areas and sidewalks	Port structures and plates in parking garages
Environmental classes EN 206	X0	XC1	XC2	XC3	XC4	XF1	XS1, XD1, XF2	XF3	XD2, XD3, XS2, XS3, XF4
Maximum w/c ratio (*)	—	0.90	0.60	0.55	0.50	0.55	0.50	0.45	0.40
Minimum strength category	—	C12/15	C25/30	C25/30	C30/37	C25/30	C30/37	C35/45	C35/45
Minimum binder material content (kg/m ³)	—	—	200	200	200	200	200	225	300 (***)
Minimum air content after pumping (%)						5.0(**)	5.0(**)	5.0(**)	5.0(**)
Maximum surface flaking over 56 freezing and thawing cycles (kg/m ²)	—	—	—	—	—	2.0	1.5	1.0	1.0

(*?) The w/c ratio is defined in Article 8.3.9.

(**) The reference for measurements of air content is average mineral density (water absorption around 3%) and D_{max} > 16 mm. Minimum air content need not be considered after pumping if there is no frost strain.

(***) Binding materials in class XÚ4 shall contain a minimum of 6% silica dust.

Concrete exposed to chemical strain shall conform to exposure class XA2 or XA3 as shown in Table 1 and Table F.1 of the ÍST EN 206 standard. Designers shall specifically take this into account when evaluating requirements for its composition.

Requirements for concrete may be relaxed with regard to the values in the table for classes XC, XD and XS if the coverage of the reinforcing bars is increased or where rust-free reinforcements or other non-corrodible materials are used as bearing reinforcements.

Article 8.3.7.

Conformity requirements and frequency of measurements.

Conformity requirements and frequency of measurements shall conform to the ÍST EN 206 standard. Requirements for concrete are subject to measurements at the building site just before the placement of concrete.

Concrete manufacturers are permitted to carry out the main part of controls at the concrete plant but shall always monitor and factor in possible changes to the concrete that might take place between the mixing site and the building site.

The frost resistance of concrete shall be tested using the method in Chapter 5 of the ÍST CEN/TS 12390-9 standard, with salt. It is permissible to use both 150 mm cubes and 150/300 mm cylinders for this measurement.

Frost resistance measurements of concrete in exposure classes where frost resistance is a requirement shall be part of the production controls. The frost resistance of concrete shall be tested either for each 2500 m³ of prepared frost-resistant concrete or by taking one sample per month during those months when frost-resistant concrete is being produced, choosing whichever method yields more samples. Where frost resistance is not defined differently, it shall be measured after 28 days of setting. For environmental reasons, frost resistance can be defined after a longer setting time, e.g. 90 days, especially when using a binder material with admixtures where the increase in frost resistance is greater after 28 days of setting than with CEM I cement.

The air content of concrete shall, as a rule, be measured for each concrete sample and the frequency of the measurements shall be the same as that for compressive strength. Air shall be defined as a minimum value using the coefficient of variation given in the ÍST EN 206 standard. Air measurement for the air content of open and very dense minerals must be corrected.

The water-cement ratio may be measured by drying out in a microwave oven. In such cases, the frequency of the measurements shall be, as a rule, the same as for compressive strength.

Article 8.3.8.

Calculation of water-cement ratio and k-value.

When calculating the water-cement ratio (w/c) and the volume of binder materials, a catalytic factor (k-value) shall be applied to admixtures in keeping with chapter 5.2.5 of the ÍST EN 206 standard. The water-cement ratio = $\text{water}/(\text{cement} + k \times \text{admixture})$.

When evaluating the performance and k-values of new admixtures, they shall be compared to pure CEM I cement as regards the properties that are important for the exposure class that will apply to the concrete, e.g. frost resistance, strength, chloride conductivity index and carbonation rate.

Article 8.3.9.

Measuring compressive strength and modulus of elasticity.

The compressive strength of concrete shall be determined using either 150/300 mm cylinders or 150 mm cubes, but the use of 100/200 mm cylinders or 100 mm cubes is also permitted, in which case the measured value shall be reduced by 4%.

Where the modulus of elasticity is not defined differently, it shall be measured after 28 days at 20 °C. Under exceptional circumstances, compressive strength may be defined after a longer or shorter setting time and taking into account, for example, the type of cement and the admixture. If it is demonstrated that the strength of the concrete has increased by 20% from the one-year measurement, the compressive strength may be measured after 56 or 90 days instead of 28 days. Monitoring that the increase in strength is correct shall be a standard part of production controls and shall never be carried out without prior consultation with the designer and clients.

The modulus of elasticity may be measured using 100/200 mm cylinders instead of 150/300 mm cylinders, in which case the measured value shall be adjusted using the following equation:

$$E_{c150}=0.83E_{c100}+4.125$$

where E_{c150} is the modulus of elasticity in GPa, measured using 150/300 mm cylinders, and E_{c100} is the modulus of elasticity measured using 100/200 mm cylinders.

Article 8.3.10.

Production licences for concrete plants.

A concrete plant's permission to produce concrete for use in construction under this Regulation is subject to the concrete in question conforming to the relevant provisions of Chapter III of the Construction Products Act. The manufacturer's statement shall be made on the basis of the report of an independent inspection body that has inspected the production in accordance with the ÍST EN 206 standard. Independent inspection bodies shall have been recognized by the Minister.

Article 8.3.11.

Supervision of production.-

The production of concrete shall be subject to internal and external production controls in conformity with Annex C of the ÍST EN 206 standard.

Testing laboratories performing comparative tests for external controls shall use calibrated equipment and have skilled personnel and shall perform regular comparative tests to ensure the reliability of the measurements.

When concrete is produced for a single specific project, the client can decide to use a different type of external control, with the approval of the building commissioner.

Article 8.3.12.

The manufacturing of concrete in the absence of production controls.

In the absence of a concrete plant conforming to the provisions of Article 8.3.11, a building commissioner can authorize the production of concrete for a single specific structure, in keeping with point 2 of paragraph 2 of Article 9 of the Construction Products Act. This shall only be permitted provided that the construction in question falls under magnitude class 1 and the minimum amount of cement is 350 kg per every m³ of concrete.

Licences to produce concrete in keeping with Paragraph 1 shall be in writing and only applicable to a single specified project.”

Article 3

This regulation, laid down pursuant to paragraph 1 of Article 60 of the Construction Act No 160/2010 shall enter into force forthwith.

Article 4

This regulation has been notified in accordance 8 with the provisions of Directive (EU) 2015/1535 laying down a procedure for the provision of information in the field of technical standards and regulations.