ETC-C

EPR TECHNICAL CODE FOR CIVIL WORKS

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afcen

French Association for Design, Construction, and In Service
Inspection Rules for Nuclear Island Components

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NOTE TO THE USER

This document proposes modifications identified through:

- the feedback of AFCEN codes users.
- the preparation of "Traduction Française de l'Edition RCC-CW 2015".

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The elastic displacement of the circular slab embedded at the periphery and loaded by a unit force concentrated on a circular area is given by:

Equation 1.C-19

$$\frac{1}{K_{dy}} = w = \frac{a^2}{64\pi \cdot D} \cdot \left[4 - 3 \cdot \gamma^2 + 4 \cdot \gamma^2 \cdot \ln \gamma\right]$$

with:

– $\gamma = a / r$.

The elastic resistance R_{dy} of a circular slab embedded at the periphery and loaded by a unit force concentrated on a circular area is (the Poisson' ratio ν is taken as equal to 0):

Equation 1.C-20

$$R_{dy} = \frac{16\pi \cdot M_{dy}}{\left[\gamma^2 - 4 \ln \gamma\right]}$$

The maximum elastic displacement of the slab is given by:

Equation 1.C-21

$$u_{dy} = \frac{a^2 \cdot M_{dy}}{4 \cdot D} \cdot \frac{\left[4 - 3 \cdot \gamma^2 + 4 \cdot \gamma^2 \cdot \ln \gamma\right]}{\left(\gamma^2 - 4 \cdot \ln \gamma\right)}$$

The plastic resistance R_{dk} of the circular slab embedded at its periphery and loaded by a unit force concentrated on a circular area is calculated according to the formula from the yield-line theory:

Equation 1.C-22

$$R_{dk} = \frac{2\pi \cdot \left(M_{dk}^{+} + M_{dk}^{-}\right)}{\left(1 - \frac{2 \cdot a}{3 \cdot r}\right)}$$

With:

– $M_{dk}+$ the ultimate bending moment which creates tension in the lower fibre;

– $M_{dk}-$ the ultimate bending moment which creates tension in the upper fibre.

The maximum plastic displacement of the slab is evaluated according to the allowed rotation θ_{lim} of the plastic hinge:

Equation 1.C-23

$$u_{dk} = r \cdot \theta_{\lim}$$

1.C.4.3 ELASTIC SPRING OF THE SURROUNDING STRUCTURE

The elastic spring which represents the surrounding structure is defined according to the two calculations which determine the radius of the circular slab. The displacement difference between the two calculations for a unit force gives the elastic stiffness of the surrounding structure.

Na_2O + 0.658 K_2O

(With Na_2Oe_q = ~~0.658 Na_2O + K_2O~~), determined in accordance with Section 8.

If δ is negative, no alkali is added.

– In the absence of data on the dispersion of alkali content, the amount of Na_2O to add in the form of sodium hydroxide NaOH in concrete samples is equal to:

Equation 2.H-2

$$\delta = 0.0025 \,.\, C \,.\, A_{ech}$$

2.H.5 IMPLEMENTATION OF THE TEST

2.H.5.1 PREPARATION OF TEST

The constituents, their dosages and operating procedures (order and mixing period) must comply with site conditions, in particular for admixtures.

Perform the mixing in a temperature controlled room at 20 ± 2 ° C. The minimum mixing duration is 3 minutes (unless otherwise specified for admixtures). The mixing conditions must be recorded in the test report (in particular the rotational speed of the mixing system rev/min).

The order of introduction of materials is as follows:

- Approximately half of coarse and fine aggregates and any corrective particle size;
- Cement and any additions;
- The rest of coarse and fine aggregates;
- The mixing water containing the addition of NaOH (it is necessary to ensure that the sodium hydroxide is completely dissolved before adding to the mix).

The identification elements of the concrete formula, possible additions of NaOH and admixtures, and its basic characteristics (W/C, slump or spread…) are recorded in the test report.

2.H.5.2 PREPARATION OF CONCRETE PRISMS

Use moulds for prismatic samples of 70 mm × 70 mm × 282 mm, three parts per mould. Each part is first lightly oiled and fitted with stainless steel studs (not oiled).

The moulds should be filled to half its height prior to placing on the vibrating table, where the remainder of the height of the mould is filled, unless using self-compacting concrete,

The time of vibration is timed and adjusted depending on the consistency of concrete: the vibration is stopped as soon as there is appearance of laitance. The concrete must be flush with the top of the mould. The conditions for placing (self-compacting, type and duration of vibration, etc) must be recorded in the test report.

The concrete surface is preferably left unchanged: without levelling or trowelling which, if proved necessary, should be kept to a minimum so as not to loosen the upper part of the sample.

The mould filled with concrete is protected by a plate described in 2.H.3.2.5.